



JOURney

vol 1 | Spring 2017

Letter From the Editor

Dear Reader,

The entire editorial board and staff are pleased to present the first volume of the University of North Carolina's Journal of Undergraduate Research (UNC JOURney). I believe this journal expresses the wide variety of academic disciplines and opportunities the University of North Carolina at Chapel Hill (UNC-CH) offers students. The eleven articles published in this edition explore the natural sciences, social sciences, humanities, and health. As the university works to accomplish the goals set before it in the Quality Enhancement Plan, I hope the efforts to create this journal showcasing UNC-CH's engaged undergraduate student researchers will continue to spur and inspire students to engage in research opportunities.

UNC JOURney was started this year with the goal to give students a place to publish faculty-mentored research, including SURF projects, partial and full honors theses, and other independent research. UNC JOURney is an annual journal dedicated to celebrating and supporting the original research conducted early in students' academic careers that reflects appropriate scope and complexity for excellent undergraduate work. Through our partnership with UNC-CH's Office of Undergraduate Research, this journal is accomplishing this goal.

UNC JOURney would not have been possible without our dedicated editorial board. I would first like to thank all of our section editors, readers, and publicity chairs. Next, a huge thank you to my managing editor Maggie Hilderbran ('19), graphics editor Webb Hinton ('18), publicity director Sean McCaffery ('20), and website designer Sarah Beth Marriott ('19). Their ideas, passion, and leadership on this project have carried this first volume to publication, and I could not be prouder to have served as their editor-in-chief.

I would also like to acknowledge the unwavering support of the Office of Undergraduate Research. They have continuously offered the entire editorial team guidance while establishing this new venture on campus. Specifically, I thank interim associate dean and director Dr. Troy Blackburn (Department of Exercise and Sports Science), outreach coordinator Yesenia Merino, and business services coordinator Denise Carter.

Lastly, thank you to everyone who submitted a manuscript for consideration in this edition of UNC JOURney and to our readers for taking the time to explore and learn about the research occurring at UNC-CH. Please enjoy this inaugural edition of UNC JOURney; the entire staff and I hope that you enjoy these unique and interesting pieces of research.

Sincerely,
Gabi Stein
Editor-in-Chief

A handwritten signature in black ink that reads "Gabriella Stein". The script is fluid and cursive, with the first name and last name clearly legible.

Table of Contents

Social Sciences

7 **False Hope: Body-Worn Cameras as Community Policing in Durham, North Carolina**
by Vishnu Ramachandran

17 **FARC and Paramilitary Violence in Urabá, Colombia**
by Luis González Chavez

24 **Barriers to Treatment: Colorblindness and Eating Disorders for Black Women**
by Alexis Roane

Health Sciences

38 **Drug Delivery Particle Simulations to Predict Optimal Maxillary Sinus Deposition in a Post-Surgical Chronic Rhinosinusitis Patient**
by Snigdha Das, Julia Kimbell

42 **Sleep, Perceived Stress, and Salivary Cortisol Response in Undergraduate Students**
by Jessie Van Gaasbeck , Jyotsna Panthee Caroline Owens, Ritu Malla, Sofia Edelman and Joseph DelFerro

50 Examining the Involvement of Limbic Brain Circuits in Modulating Sensitivity to Alcohol Drug States

by **Verda Argan**

54 Respiratory Sinus Arrhythmia Predicts Future Infant Sleep Quality and Emotional Reactivity to Stress

by **Archita Chandra**

Humanities

67 Rethinking Italian Literature Towards Inclusion

by **Julie Canziani**

74 A Taste of Power: The Rhetorical Poetry of Elaine Brown

by **Cameron Jernigan**

Natural Sciences

81 *A. tumefaciens* Succinoglycan Mutants

by **Taylor Aliano, Brooke Bowman, Briana Stockdale, Lacie Morrison**

86 Evaluation of Two Competing Hypotheses for the Contact with the Sage Hen Flat Pluton, White Mountains, Eastern California

by **Lizzie Wilson, Jed Higdon, Jack Davidson**

Staff

Executive Board

Editor-in-Chief

Gabi Stein

Managing Editor

Maggie Hilderbran

Graphics Editor

Webb Hinton

Publicity Manager

Sean McCaffery

Website Design

Sarah Beth Marriott

Editorial Board

Social Sciences

Co-Editors

Zoe Hazerjian

Carrington Merritt

Health Sciences

Co-Editors

Marissa Rice

Humanities

Co-Editors

Rebekah Cockram

Natural Sciences

Co-Editors

Alison Hollis

Emily Hightower

Additional Thanks to:

Sarah Dong

Sabrina Shah

Alexander Li

Evelyn Morris

Kat Doan

Troy Blackburn

Roy Hull and Triangle Press-
es

Our Copy Editors

Visit <http://uncjourney.unc.edu/> to learn more about JOURney and submission guidelines visit, and <https://www.facebook.com/uncjourney/> to like us on Facebook

Social Sciences

7 - 15

False Hope: Body-Worn Cameras as Community Policing in Durham, North Carolina
by Vishnu Ramachandran '19

Faculty Advisor: Torin Monahan, PhD, UNC Department of Communications

In his independent research project, Vishnu offers a critical analysis of the policies of police body camera use within the Durham, North Carolina Police Department. In addition, he describes the shortcomings of police body cameras as a method to promote community policing. The general guidelines regarding body camera usage, access to footage produced by the cameras, and funding sources for the technology are discussed in this article. Furthermore, there is explanation of how the implementation of body camera policy in Durham, NC ultimately deviates from the goals of community policing.

16 - 23

FARC and Paramilitary Violence in Urabá, Colombia
by Luis González Chavez '17

Faculty Advisor: Dr. Cynthia Radding, UNC Department of History

For his senior capstone, Luis analyzes the long-standing conflict in rural areas of Columbia caused by the guerilla warfare of the Revolutionary Armed Forces of Colombia (FARC), with the devastation of the Uraba region as the primary focus. The strategies used by the FARC are detailed through an analysis of Documentos y Correspondencias de Manuel Marulanda Vélez: 1993-1998. This analysis is followed by an examination of how such paramilitarism strategies resulted in the deterioration of the vulnerable, rural populations of Columbia.

24 - 36

Barriers to Treatment: Colorblindness and Eating Disorders for Black Women
by Alexis Roshane '18

Faculty Advisor: Dr. Candis Smith, Assistant Professor, UNC Department of Public Policy

During Alexis' participation in the Moore Undergraduate Research Apprentice Program the summer of 2016, she analyzed socio-cultural barriers that black women face when receiving diagnoses and treatment plans for eating disorders and disordered eating. Alexis conducted interviews with healthcare professionals at a predominately white college campus in order to highlight how the color-blind nature of eating disorder research and treatment affects women of color.

False Hope: Body-Worn Cameras as Community Policing in Durham, North Carolina

by Vishnu Ramachandran

Police body cameras are often presented as a tool for reducing police violence while also enhancing trust and accountability. However, the policies governing the technology can call these goals into question. To explore the assumptions behind police body cameras and the ways in which their use is shaped by local context, this paper follows the city council debates leading to the adoption of—and policy guidelines for—police body cameras in Durham, North Carolina. In this example, we see that the city council aimed to promote community policing through body camera usage, to allow the citizens to “police” the police and increase trust. The policy guidelines, on the other hand, create nebulous expectations for police behavior and fail to acknowledge power asymmetries. Furthermore, the video access statutes grant significant discretion to the police department and its officers but limit public oversight. Finally, the asset forfeiture funds used to finance the program might spell exploitation. Ultimately, Durham’s implementation of police body cameras strays far from its community policing goals.

Keywords: Police body-worn cameras, police brutality, police accountability, police violence, community policing, crime prevention, public record, asset forfeiture, local government

Introduction

In 2014, Darren Wilson shot and killed Michael Brown, but was not charged by a grand jury, catalyzing a movement to “root out” police misconduct.¹ High profile police brutality cases, such as this, have launched police body-worn cameras (hereafter referred to as “body cameras”) to national prominence.

Several states, with support from the Obama Administration, began retrofitting their police officers with body cameras and testing the technology.² Although there have been several studies analyzing the police body camera efficacy, there is still not a consensus on their impact for local policing.³ For example, the study conducted in Rialto, California that many body-camera advocates cite has been shown to have a serious conflict of interest.⁴ Given the unclear effectiveness but the large movement to adopt police body cameras, local governments across the nation are engaging in a vast, uncontrolled social experiment.

In this paper, I follow and theorize Durham, North Caro-

lina’s discussions on body cameras as the city council debates a contract approving their purchase. I conducted text analysis of city council meetings, police department publications, statements by stakeholder groups, and news articles.⁵ I point to how the community contextualized the body cameras, addressed concerns about them, and ultimately approved their purchase without enough scrutiny.

A Culture of Trust

In Durham, the conversation about body cameras and police accountability centers on trust as built through community policing. Community policing is an umbrella term for practices that arose in the 1970s as a way to “repair police-minority relations.” Originally, it was a “cosmetic” change meant to enhance the image of police departments.⁶ Now, the term refers to a paradigm shift in how police officers interact with the community; it aspires to a culture of trust. Rather than the “control of crime,” such policing seeks to engender “community order, peace and

security.”⁷ In the model, police will aim to prevent rather than respond to crime. They will share the “responsibility for crime and order” by pursuing a “flexible” and “open” organizational structure focused on community building.⁸ For example, the practices can manifest as engaging directly with individuals in an area, understanding and supporting them. The practice could also involve establishing partnerships in neighborhood watches or youth clubs to encourage responsibility and autonomy. Community policing, if executed properly, can support the “safe and secure environment” it seeks.⁹

Durham Police Chief C.J. Davis has professed a commitment to community policing principles to advance her department. To her and, by extension, the department, community policing reflects a desire to mend “fractured ... relationships” and reverse the “lack of trust,” reducing violent crime and making Durham safer.¹⁰ She emphasizes a “two-way street,” focused on building communities not extracting from them.¹¹ Moreover, she advances the “normal day” over the “crime scene,” meaning police personnel should focus on fostering meaningful relationships every day instead of antagonizing the community after crimes.¹² In an interview with a local newspaper, the police chief more specifically described her conception of community policing:

“Community policing is not going to community meetings. Community policing is a mode of operation every day. It is talking to people. It is getting out of your car and knowing the people on your beat, making them feel comfortable that you are the police, and you are there for them and that they can call you by your first name. It is about relationship building. From what I have gathered in my meetings with Durham police officers, they want a better relationship with the community. They want to go into a meeting without it being a hostile environment.”¹³

The Durham City Council subscribes to a similar conception of community policing, supporting a culture of trust to tackle the systemic issues underlying crime. They base their support on the premise that police officers represent the people. Council member Charlie Reece characterized them as follows:

“... Durham police officers ... are paid with our taxpayer dollars, ... are hired by our police department, ... are governed by our laws, and ... enforce those laws with authority that we as the people of this city grant to them ...”¹⁴

Thus, the city council recognizes the connection between the Durham police and the community; officers are both a part of and a product of the community that imbues them with power. Their power comes from the people, so their authority is not separated but rather grounded in the community. As a result, police officers have the onus of not only punishing crime from afar, but also preventing crime from within to better their city.

The council members and the police department agree that as part of the community, officers should be trustworthy and accountable. Yet, Durham has witnessed several controversies with the police department. For instance, the previous police chief was replaced over questions of increasing crime rates, restrictive transparency policies, and possible racial bias.¹⁵ National controversies, such as high profile police shootings, have further inflamed the issue at the local level.

Notwithstanding critiques of community policing, for the City of Durham this model represents a solution to the problems that the police are facing with their behavior and with people’s trust.¹⁶ It reflects a shift in how police can operate to bring themselves closer to the role and the people they should serve. The Mayor Pro-Tempore Cora Cole-McFadden commented on the how she envisions the police department:

“I don’t want to cast a negative light on our police officers or our police department. I trust that we’re going to do the right thing. I trust we’re going to continue in our community policing efforts. We are not going to see our police personnel as warriors. They will be seen as guardians. That’s what you want. That’s what we want in Durham.”¹⁷

The city, therefore, believes that community policing is an avenue to rectify problems and “rebuild trust” during contentious times.¹⁸

However, the paradigm shift from “warriors” to “guardians” requires specific actions.¹⁹ Instilling police officers with community policing principles, taking the idea from a motif to an actuality requires sensible policies. A culture of trust necessitates more than ideas.

A Mirror and A Prison

Body cameras are one possible policy to help realize community policing and its benefits. Using the technology, the Durham City Council aims to reduce police violence and citizen grievances to increase “accountability” and “trust” in the department.²⁰ By wearing police cameras, police officers willingly accept scrutiny to help engender trust. The city council, the police department, and citizen stakeholders believe that body cameras can accomplish these goals by being a mirror and a prison.

The most important distinction is who is watching whom. A citizen attending the first city council meeting involving body cameras outlined the mirror in the following statement to the members:

“I think that it is extremely important to bear in mind that where body cameras are doing any good whatsoever, it is not to help the police surveil communities. It is to help communities surveil the police... Help us watch the police, not help them watch us.”²¹

Body cameras, according to this citizen, are a form of “reflectionism” that turns the gaze on the police.²² Doing so challenges officers to critically think about their authority and what they would do if they were civilians in the

situation; the officers would have to consider alternative behaviors if they found their actions unacceptable. Reflectionism, thus, reveals implicit hierarchies, making police behavior issues easier to solve.²³

Another citizen present at the meeting commented on visibility as well, emphatically stating:

“The reason why public lynchings in this country are no longer ... is because of the publication of photos by the NAACP, showing for example Emmitt Till and Jesse Washington. Shining light on ugly stops the ugly.”²⁴

This explanation also highlights reflectionism, but more importantly, it accentuates the Enlightenment principles that underlie the panopticon, an “all-seeing” prison concept originally envisioned by the philosopher Jeremy Bentham. The prison he conceptualized would allow guards to surveil prisoners at will while prisoners themselves could never see the guards.²⁵ Herein lies the Enlightenment promise. By constantly watching and regulating, by “shining light on the ugly,” the guards could slowly discipline the prisoners or “stop the ugly.”²⁶ Michel Foucault, in the 20th century, analyzed Bentham’s panopticon and concluded that those who are under panoptic “visibility” internalize the disciplinary gaze and police themselves, even in the absence of a watcher and recognize it internalize the guards’ authority and subject themselves. In other words, the knowingly watched police themselves. Under this view, body cameras would allow civilians to watch the police, forcing the officers to correct themselves.

Several arguments presented at the city council meetings built on Foucault’s conception of the panopticon and its resulting self-policing. One of the council members, referencing the Rialto study, cited the “preventative treatment” body cameras provide; he advocated for requiring the police to announce that they are recording interactions whenever possible.²⁷ When everyone is “being watched,” they will “follow the rules,” he quoted from the body camera study conducted in Rialto, California.²⁸ Such a requirement will encourage civilians to behave better – more than they would with police surveillance alone. More importantly, however, the discipline also applies to police officers. The panopticon can make the officers police themselves. Chief Davis further supported this claim by arguing:

“The idea of body cameras, dash cam video is very important for officers to know even internally we have a way of examining what occurred at a particular incident. When individuals are being recorded, they have a tendency to adjust their behavior, and I believe the body cameras are going to be very beneficial for the department regardless of what the legislation says.”²⁹

“Internally,” the chief and other ranking officers, can keep track of individual police on the streets.³⁰ In one possible protocol, those officers being watched will, abiding by the

panopticon, modify their behavior because they do not know when their footage will be reviewed by authorities and other community members who can report misbehavior.

The Durham FADE Coalition, a group focused on equitable policing, released the following statement, reflecting the general consensus on body cameras:

“Durham community members have clearly supported the use of body cameras that document interactions between Durham’s police officers and Durham’s residents. These community members have expressed hope that additional monitoring will motivate police to treat residents in our poorer neighborhoods with the respect they deserve. They hope that body cameras will serve to document police use of force and that police officers who consistently disrespect people and violate the constitution will be exposed. They further understand that body cameras can also protect police officers who are doing their job properly from false claims and help document the crimes they are investigating.”³¹

This statement succinctly summarizes the wide approval for the technology itself, whether they embody the mirror or the prison. From the perspective of this citizen group, surveillance does not appear to be a problem as long as it serves to advance community policing, to benefit Durham. Seemingly, cameras will record situations as they are, “shining light” on the darkness.³²

Policy Threats to the Model

Even if the theory underlying body camera use is sound, the implementation of the policy can threaten the community policing model, as noted by an ACLU policy counsel.³³ The policy threats revolve around defining expectations for police behavior, balancing transparency and privacy, and funding the technology with asset forfeiture. The city council and the police department in Durham discussed these limitations extensively and listened to citizens and other stakeholders. Over the course of the debate, the city attempted to incorporate solutions in the general order governing body cameras.

Nebulous Expectations for Police Behavior

At the first city council work session involving the cameras, the Deputy Police Chief Larry Smith said, “It’s really simple to use ... on ... off [powering down the body camera].”³⁴ His demonstration was followed by a series of questions about the limited guidance for body cameras in subsequent meetings; the technology is easy to abuse. One concerned citizen argued:

“You wouldn’t expect anyone to have a can of pepper spray without knowing how to use it – when and where they are supposed to use it, how they are supposed to use it. You wouldn’t do that for any piece of equipment, and there seems that there is no governance or policy with this for them to know when and where they should

use it and how they should use it and what times.”³⁵

As an individual with security experience, this citizen expressed disbelief at the limited “governance” for body cameras when less technical tools like “pepper spray” have clearer guidelines.³⁶ Attacking an innocent bystander with pepper spray is clearly wrong, but recording her could be questionable. There is no clear answer. As such, the citizen’s concerns revolved around ensuring the police behavior would be regulated for the community’s benefit. Given how easy the camera is to turn off, malicious officers who want to hide certain encounters or well-meaning police who record something they should not, for example, can both compromise the policy’s integrity.

Addressing these concerns, the police department and the city council amended the general order. After doing so, however, the council continued to have questions about the rules, especially regarding how confusing the guidelines are. Councilman Reece the issue as follows:

“... You know, one of the things that struck me about the draft of the policy is that it contains quite a few guidelines about situations in which officers may deactivate their body cameras, in which they are prohibited from turning on their body cameras, about when they may turn the camera off and when they may turn it back on.”³⁷

Though the rules were meant to clarify how the police are expected to use cameras, the excessive rules may make the policy more difficult to follow and standardize. To optimize the general order, there appears to be a consensus that the police department should not micromanage their officers but give them consistent rules – ones with clear expectations. (See “Transparency and Privacy” for more information on recording rules.) The Deputy Chief Smith volunteered discipline as a way to standardize police behavior involving body cameras. He explained:

“Officers can’t access – all they can do is look at that video and label it. They can’t delete it, alter it, redact it. They can’t even make their own DVDs. They are prohibited by policy from obtaining personal copies for any reason ... We have got a strong policy. A strong portion of the policy says if you don’t record something, you got to make us aware of why. We need an explanation. If that happens too many times, there’s going to be some problems.”³⁸

Police discretion, according to the deputy chief, is more limited than it may seem. Their recording behavior will be dealt with internally, encouraging proper usage. The guidelines serve as a starting point for officers to discover what behaviors are acceptable.

However, this policy solution does not specify what actions the police department will take to either teach or discipline the officers so that she will know what is expected of her. Without such information, it seems likely officers will want to err on the side of increasing surveillance; they

would rather have more video than less. This could prove problematic for the community policing model. Increasing the surveillance of marginalized communities could do more to alienate disadvantaged groups. If a police officer is constantly recording and is required to state that he is recording, it will be difficult to establish mutual understanding and trust. Rather, the officer will be placing himself above or outside, not within communities. He is there to surveil. That is not the behavior a community policing model would encourage in its officers.

Transparency versus Privacy

The question of proper police behavior relies on balancing transparency and privacy. The first question to ask is what these cameras should record? Addressing proper use, Councilwoman Jillian Johnson said the following:

“In order for these to be effective tools, they can’t actually be on all the time because they would be recording a lot of things not relevant to a police investigation. But that requires the officers to have the authority to turn the cameras on and off. And this has resulted in a number of incidents nationally where cameras were off when important incidents occurred that should have been recorded. That has happened in several cities in North Carolina recently.”³⁹

Her comment alludes to the confusing guidelines the police department has stipulated for body camera usage. The guidelines rightly assume that not everything should be recorded; police officers should not record their personal lives or suspects’ strip searches, for instance.⁴⁰ These rules are clear. However, there are more ambiguous guidelines that police will have difficulty following. For example, police are encouraged to activate their cameras when engagements become “adversarial,” but deactivate them at their discretion when a “non-suspect” requests it.⁴¹ The varying responses officers will have in similar situations will reduce the benefits of cameras. The saved footage will not represent what actually transpired in police-citizen interactions; the video across the department would be haphazardly recorded, and there would be less reason to trust in its objectivity. Instead of erring on the side of more surveillance, as the deputy chief’s comments would imply, to standardize operations, an ACLU policy counsel recommended that officers should only record “when engaging with individuals.”⁴² The police should focus on policing themselves during interactions rather than surveilling others.

A significant issue with constant recording is the data retention policy the Durham Police Department has proposed. The department retains all data for at least six months, twenty years for felony cases, and indefinitely if they deem it necessary.⁴³ There are specific exemptions to the rules in place, but generally, if footage is created, it will remain in the department’s archives for at least six months. The video in the repositories could include foot-

age from inside people's homes or otherwise sensitive information. Ideally, relevant data should be "flagged" and retained whereas other data should be deleted quickly.⁴⁴ The police department's retention policy does not reflect that, and furthermore, the department will not consider appeals for removal from non-police.⁴⁵

Treating video as public records, especially if it contains sensitive material, causes several issues. There is good reason to not give everyone access to the body camera footage. As Councilman Schewel explained, "It would not be the officer who is embarrassed. It would be the community member who would not want his actions released willy nilly to the public and the media."⁴⁶ The council member focused on preventing "shame" for unsuspecting Durham residents. Police recordings of people should not be released to the community unless doing so is in the public interest, and moreover, people who have been recorded should have an avenue to procure footage they are in.⁴⁷ There are, however, some possible solutions. The same council member advocated for creating an "independent review panel" to release video in accordance with the aforementioned principles.⁴⁸ The panel should seek to provide transparency while upholding privacy.

On the other hand, the police department appeared to be against treating the captured video as public record in any situation. In their general order drafts, the department cited North Carolina General Statute §132-1.4 to classify all body camera footage as part of a "criminal investigation" and separate themselves from the federal Freedom of Information Act, thereby preventing any body camera footage from becoming part of the public record.⁴⁹ Furthermore, the department classified video of police officers as "personnel records," which the department would need to protect by law.⁵⁰ In short, the Durham Police Department's general order placed any and all body camera video firmly within their control. The department stifled the transparency the cameras were meant to bring.

The city council, in response, tabled the body camera purchasing contract in February to ensure that this issue would be resolved before the police department procured the technology.⁵¹ The city and the police would work together to amend the general order. Some in the community hoped that the state legislature would "enact clear body-camera laws that satisfy the general public's twin desire," balancing transparency and privacy.⁵²

House Bill 972, passed by the North Carolina state legislature over the summer, was not the compromise Durham was expecting. The governor signed the bill into law, which went into effect in October 2016. The law created a statewide distinction between disclosures and releases of footage, but more importantly, it made getting approval from a judge the only way to access the footage as a layperson, adding a significant barrier.⁵³

Council members and the police chief immediately sought ways to circumvent the new state law. Councilman Steve Schewel stated the following regarding "judge shopping" or strategically choosing judges who will

"consistent[ly]" release footage to the public and sidestep the state law.⁵⁴

"We are fortunate in Durham to have superior court judges who are extremely likely to approve the release of body camera footage if requested to do so by member of the public with good reason or by the police chief, city manager, or the council. I have every confidence that we can get the footage released if we needed to do so in the public interest."⁵⁵

His understanding was that as long as citizens could obtain the records in some way, there would be sufficient transparency. The deciding criterion was access, not ease of access. Other council members reacted differently. Council members Johnson and Reece, respectively, spoke out against the state law and, by extension, body cameras as follows:

"I believe that without meaningful public access to the footage, body cameras are primarily a tool for government surveillance and not for police accountability and that the new state law without changing these policies at the state level ... body cameras will not be able to serve these goals."⁵⁶

"But ultimately, what are we doing if we are buying these cameras, collecting this video, and we have to go and supplicate ourselves before a superior court judge to have any of that released. That's not right. That's not transparency. That's not enforcing accountability. And for that reason alone, I would vote against it."⁵⁷

Their comments reflect how the state law consolidates information in the police department, reducing transparency, accountability, and ultimately trust.

More generally, the control the police department exerts on body camera use, footage retention, and public access removes the policy from its community policing roots. There is no independent panel or citizen involvement; the police will choose how the policy will serve the people without community involvement – no sharing of responsibility. Through the body camera policy, the police department distances itself from scrutiny and tends towards control – not community.

Asset Forfeiture

The funding source for the body cameras is also contentious because \$230,000 of the projected \$1.4 million cost will come from asset forfeiture.⁵⁸ Asset forfeiture, as defined by the Department of Justice, involves "removing the proceeds of crime" to weaken criminal organizations.⁵⁹ This allows the state to confiscate property used in or derived from criminal activities. The Durham Police Department receives these funds for working with the federal government, as the Chief Davis explained:

"We are constantly receiving asset forfeiture money. Our asset forfeiture funds come from our task force work

that we do with federal cases on the federal level with the DEA [Drug Enforcement Administration], the ATF [Bureau of Alcohol, Tobacco, Firearms and Explosives], all of our federal partners. We have officers that work in the region, not necessarily in the city of Durham, but in the region. And they work high level cases. Most of the time, they are not one-time types of seizures. They're seizures that involved long types of investigations that involve many people, a number of different locations and property. So, once we receive word from our federal partners that we have a seizure, the Durham Police Department gets a percentage of that seizure. Normally, it is about 80%, especially if one of the investigators is lead investigator. That's how we receive those funds. It's not an annual amount that we can anticipate whatever the case happens to develop."⁶⁰

By working with the DEA and the ATF, the police department ostensibly plays a role in preventing drug abuse and gun violence in the process of receiving funds.

Organizations, such as the FADE [Fostering Alternative Drug Enforcement] Coalition, vehemently oppose asset forfeiture. They claim that the funds are taken from "over-policed communities" and that using the funds engenders "an unhealthy incentive" to focus on increasing revenue⁶¹. This will encourage the police department to look elsewhere for funding, possibly extracting it from the community. Councilwoman Johnson also disagreed with the practice on constitutional grounds, commenting:

"I consider asset forfeiture to be legalized theft, and I do not believe that we should be using that money. Asset forfeiture funds are taken from people who are simply accused of crimes and not convicted, and we in this country believe that people are innocent until proven guilty, so this is money being taken from innocent people and being used to support policing around the country."⁶²

The outcry from the community and from council members demonstrates that asset forfeiture could threaten the community policing model Durham supports.

While the Department of Justice claims that asset forfeiture is instrumental for drug enforcement and their other objectives, the "targets ... are chosen for their resources instead of their criminal activity."⁶³ In their inability to prevent crime, the Department of Justice and local police departments have turned to "profiteering," undermining "ideals of fairness and justice," the ideal of community policing in Durham.⁶⁴ Thus, using asset forfeiture funds to purchase police body cameras appears contradictory.

A Silent Majority

LaVante Biggs, a suicidal young man, was shot and killed by Durham police in 2015.⁶⁵ Two years before, in 2013, Jose Ocampo was also killed by officers.⁶⁶ Later investigations proved that neither victim posed an immediate threat to police officers on the scene. Durham, like the nation itself, has faced the tragedy of fatal police shoot-

ings. The city council and the police department are not immune from the community's visceral reactions. Councilman Schewel stated:

"I plan to vote for the purchase of the cameras tonight. Yes, they're expensive, but if we use them correctly, they can be a great benefit to our city. I understand some people oppose their purchase on civil liberties grounds, and I respect that very much. I understand that there are two sides to this issue. But just suppose there is a police involved shooting in Durham, and we have passed up the chance to purchase these cameras. I believe that the same civil libertarians, among whom I count myself, will be back before us wanting more information about that shooting, information that these cameras could provide. I wish we had body cameras when Jose Ocampo was killed or when LaVante Biggs was killed, both shot by police officers. It would have helped their families, the police department, and our whole community if we had been able to have that footage. If we have another incident like that and we have turned down the opportunity to have body cameras, I think we will be very sorry."⁶⁷

This statement reflects the remorse the city council members have experienced as they have witnessed the conflict between the police and the community.⁶⁸ Espousing their community policing principles, the city council hopes to reverse the trend by making the police more accountable and trustworthy. Police body cameras are one possible solution they have considered. As the councilman noted, the city recognizes that "there are two sides to this issue," that they only found "one good study [referring to the Rialto study]," and that the policy has several problems, especially with "accessibility."⁶⁹ But, they feel the need to do something, and body cameras are one step. Their emotions seemingly overcame their concerns about the policies.

To the council, the technology serves as a necessary but not a sufficient tool for supporting community policing. Councilman Schewel explained the role body cameras plays in the larger community policing goal:

"Whatever we do with the cameras doesn't in any way absolve us, either the council or the community as a whole, from doing the other work we need to do in terms of dealing with the situation we have in Durham that creates crime. Doesn't absolve to do the work we need to do to give everyone a safe and decent house to live in. It doesn't absolve us from the work we need to do to make sure that everybody's got decent health-care, that nobody goes to bed hungry, that every kid has a good education. And those are community things. We have a role in it. You all have a role in it. We all do, and having this camera is a technical solution to a small part of this issue. That's all it is, and it won't get at the underlying causes. And there are some other things it won't do as well. It's not going to solve Durham's need for genuine community policing."⁷⁰

His description reflects the solidarity the silent majority of council members felt in supporting body cameras. "It is clear that people [on the council] who are not speaking ... want to make sure that there is some kind of record or electronic trail," said Council Member Eddie Davis.⁷¹ When the vote was tallied, only two of the seven council members voted against the contract to purchase the body cameras; remorse and hope overcame the camera's clear policy limitations for community policing.

A False Hope and A Shield for Police

Nebulous expectations for police officers, limited transparency from the police department, and a controversial funding source compromised the community policing model Durham wanted the cameras to support. In their discussion about the body cameras, the city council glossed over the built-in flaws that cast doubt on the body cameras' ability to control police officers and engender trust. Without proper precautions, the use body cameras could potentially become just a shield for police, defending rather than scrutinizing them. The city council's vote for body cameras rested on the beliefs that the technology can improve police behavior and that the council can craft effective policy that addresses known shortcomings. However, both of those premises are suspect.

First, community policing itself demonstrates some issues for creating police accountability. Although the practice can help communities, it has the propensity to "colonize" and deflect citizen criticism.⁷² The police are always there in communities; their presence and their attachment to the community gives them more credibility. Similarly, by accepting the yoke of body cameras, officers demonstrate a willingness to accept citizen scrutiny, conferring more credibility to the department. This could reduce the accountability police feel.

Additionally, shot from the police's perspective, body camera footage validates officers' perspectives and augments their already strong voice.⁷³ The video is there to capture what the police saw in the moment and to justify their behavior. As in the Rodney King case during the 1990s, police may use their authority to highlight aspects of an encounter to their benefit.⁷⁴ A "helpless" man can be cast as "a dangerous 'PCP-crazed giant'" threatening the police; seeing meaning in an interaction is "social situated."⁷⁵ When the police have footage, they gain further authority to dictate the narrative, the truth. An NAACP affiliate addressed the Durham City Council acknowledging the potential for such abuse by police:

"The policy allows officers to use the video in preparing their reports and their court testimony. The recommendation of over 33 national civil rights organizations expressly recommends that officers be prohibited from reviewing the video prior to preparing the reports in order to preserve the evidence and the credibility of their testimony."⁷⁶

The police chief quickly dismissed the concern, stating:

"I see absolutely no reason why officers cannot complete a narrative as they do today and then be aided later after they do the initial narrative from memory to fill in the gaps based on the video footage that they may need to use in order to complete a supplement to the report. As it relates to statements, officers will review video footage after making an initial statement. Their statement then will be reconciled after they review the video footage. And that way we have a more I guess what the officer's perspective was, what his memory, recollection, perspective was of whatever that incident is and then reconcile later. It is very difficult to accurately remember in high stress kinds of situations. However, we would prefer getting the officer's perspective ..."⁷⁷

Her explanation assumed that the officers need more avenues to represent their perspective, not recognizing that when people "fill in the gaps," they often shape the narrative to their benefit.⁷⁸ "Getting the officer's perspective" runs counter to the mission of community policing, which provides a stronger support system for the marginalized, not those already in power.⁷⁹

Yet, a Councilwoman Johnson wanted to continue discussing the difference perspective can create for accurately capturing a police encounter. She said,

"Even when there is footage, there are still rarely successful prosecutions of police officers for misconduct based on that footage. Bystander footage has emerged as a much better tool for actually holding police officers accountable and has been used much more effectively to raise public awareness of these sorts of incidents."⁸⁰

Councilman Don Moffitt dismissed her argument, saying:

"Sometimes there is bystander video, and sometimes there is not. And so, this [referring to body cameras] is a way of providing answers, and I think that all things considered, that is an obligation we have to provide our city and citizens with answers whenever we can."⁸¹

Blinded by their remorse, the Durham City Council ultimately failed to acknowledge that body cameras can protect police from criticism. The prevailing arguments wrongly assumed that the police voice is equal to those of the surveilled, that prioritizing the police perspective does not negatively impact the community policing model. As written, the decision will allow the police to protect their reputation without having to compromise with the community. Cameras, especially the way Durham seeks to implement them, do not share responsibility with the community or increase police accountability; to expect that they would do so is a false hope.

Conclusion

Police body-worn cameras attempt to uncover the truth in police interactions and help curb police violence. Their national prominence builds on this narrative. Local governments seeking to reconcile their police departments

with their communities, therefore, look to body cameras as a solution.

Stakeholders in Durham defined body cameras as a way to advance community policing for their constituents, and they contextualized the technology as reflectionism and panoptic visibility. By returning the gaze and by revealing the unacceptable, the goal of such cameras was to create accountability in the police department.

In the process of evaluating the technology, community members raised many nuanced concerns about police body-worn cameras and identified impediments to community policing. More specifically, they recognized institutional abuses in the form of unclear expectations for police, mediating transparency and privacy, and asset forfeiture as funding. Most importantly, the council failed to address the power asymmetry created by the perspective in the footage. The final policy decision, however, did not adequately address these concerns, thereby posing risks to the community policing model for the cameras.

Ultimately, the council's remorse for police shootings and hope for community policing encouraged them to approve the purchase contract despite the inadequate policy they had outlined, thereby leaving considerable room for abuse. They superficially addressed police accountability with their haphazard body camera policy. They generated false hope.

Works Cited

1. Brian Liebman, "The Watchman Blinded: Does the North Carolina Public Record Law Frustrate the Purpose of Police Body Cameras?," *North Carolina Law Review* (n.d.), 344, galegroup.com.
- [2] "Justice Department Awards over \$23 Million in Funding for Body Worn Camera Pilot Program to Support Law Enforcement Agencies in 32 States," U.S. Department of Justice, accessed November 19, 2016, <https://www.justice.gov/opa/pr/justice-department-awards-over-23-million-funding-body-worn-camera-pilot-program-support-law>.
- [3] See generally Barak Ariel, "The Puzzle of Police Body Cams," *IEEE Spectrum* 53, no. 7 (July 2016), doi:10.1109/mspec.2016.7498156.
- [4] Ben Brucato, "Policing Made Visible: Mobile Technologies and the Importance of Point of View," *Surveillance and Society* 13, no. 3/4 (2015).
- [5] I transcribed city council work session and meeting audio, collected news articles and documents about police brutality and body cameras in Durham, and then I analyzed the data. All source material is publicly available.
- [6] Nigel Fielding, *Community Policing* (Oxford: Clarendon Press, 1995), 25.
- [7] *Ibid.*, 198.
- [8] *Ibid.*
- [9] *Ibid.*, 197-199.
- [10] Arielle Clay, "Violent Crime, Community Relations Top Agenda for New Durham Police Chief," *WRAL.com*, May 02, 2016, accessed December 04, 2016, <http://www.wral.com/violent-crime-community-relations-top-agenda-for-new-durham-police-chief/15677914/>.
- [11] *Ibid.*
- [12] *Ibid.*
- [13] Virginia Bridges, "Durham's New Police Chief to Focus on Community Policing, Repairing Relationships," *News and Observer*, May 02, 2016, accessed December 04, 2016, <http://www.newsobserver.com/news/local/community/durham-news/article75143437.html>
- [14] Nov 21, 2016 Durham City Council Meeting Video, November 22, 2016, accessed November 22, 2016, http://durham.granicus.com/MediaPlayer.php?view_id=2&clip_id=1955.
- [15] Jonathan Rodriguez, "Durham Police Chief Lopez Forced to Retire," *WNCN*, September 15, 2015, accessed December 04, 2016, <http://wncn.com/2015/09/15/durham-police-chief-lopez-to-retire/>.
- [16] Nov 21, 2016 Meeting.
- [17] *Ibid.*
- [18] Feb 15, 2016 Durham City Council Meeting Action Agenda, April 05, 2016, accessed November 05, 2016, http://durham.granicus.com/MediaPlayer.php?view_id=2&clip_id=1834.
- [19] *Ibid.*
- [20] *Ibid.*
- [21] *Ibid.*
- [22] Steve Mann, Jason Nolan, and Barry Wellman. "Sousveillance: Inventing and Using Wearable Computing Devices for Data Collection in Surveillance Environments." *Surveillance & Society* 1, no. 3 (2002): 331-355.
- [23] *Ibid.*
- [24] Feb 15, 2016 Meeting.
- [25] Jeremy Bentham. *Panopticon or the Inspection House*. Vol. 2. 1791.
- [26] Feb 15, 2016 Meeting.
- [27] Nov 21, 2016 Meeting.
- [28] *Ibid.*
- [29] *Ibid.*
- [30] *Ibid.*
- [31] Durham FADE Coalition's Facebook page, accessed November 05, 2016, <https://www.facebook.com/DURHAM.FADE/>.
- [32] Feb 15, 2016 Meeting.
- [33] *Ibid.*
- [34] Feb 04, 2016 Durham City Council Work Session Agenda, April 05, 2016, accessed November 05, 2016, http://durham.granicus.com/MediaPlayer.php?view_id=2&clip_id=1834.
- [35] Feb 15, 2016 Meeting.
- [36] *Ibid.*
- [37] Nov 10, 2016 Durham City Council Work Session Audio, Nov 10, 2016, accessed November 23, 2016, http://durham.granicus.com/MediaPlayer.php?view_id=2&clip_id=1834.
- [38] Feb 04, 2016 Work Session
- [39] Nov 21, 2016 Meeting.
- [40] Durham Police Department, *Body Cameras General Order Draft*, (2016), <https://durhamnc.gov/documentcenter/view/8316>.
- [41] *Ibid.*
- [42] Susana Birdsong, "Police Body Cameras: Sound Policies Can Make

Them a 'win-win'."

News & Observer, last modified January 26, 2016,

<http://www.newsobserver.com/news/local/community/chapel-hill-news/chn-opinion/article56439385.html>.

[43] Durham Police Department, General Order.

[44] Birdsong.

[45] Durham Police Department, General Order.

[46] Feb 15, 2016 Meeting.

[47] Birdsong.

[48] Feb 15, 2016 Meeting.

[49] See Durham Police Department, General Order; Liebman.

[50] See Ibid.; Hudnall.

[51] "Durham Delays Body Cameras Purchase over Questions of Public Access," News &

Observer, last modified February 17, 2016,

<http://www.newsobserver.com/news/local/community/durham-news/article60810031.html>.

[52] David Hudnall, "What Good Are Durham Police Department Body Cameras if the Public

Can't See What's on Them?" Indy Week, last modified January 6, 2016,

<http://www.indyweek.com/indyweek/what-good-is-durham-police-department-body-came>

ras-if-the-public-cant-see-whats-on-them/Content

[53] See General Assembly of North Carolina, House Bill 972, (Raleigh, NC, 2016),

<http://www.ncleg.net/sessions/2015/bills/house/pdf/h972v7.pdf>; Will Dorn, "ACLU: North

Carolina Police Will Have Significant Power to Keep Body Cam, Dash Cam Footage

Secret," PolitiFact North Carolina, last modified July 1, 2016,

<http://www.politifact.com/north-carolina/statements/2016/jul/01/aclu-north-carolina/aclu-n>

orth-carolina-police-will-have-significant-p/.

[54] Nov 10, 2016 Work Session.

[55] Nov 21, 2016 Meeting.

[56] Ibid.

[57] Ibid.

[58] See Ken Fine and Lauren Horsch, "Durham Approves Body Cams, But Are They a Waste

of Money?" Indy Week, last modified November 23, 2016,

<http://www.indyweek.com/indyweek/durham-approves-body-cams-but-are->

[they-a-waste-of-money/Content?oid=5090991](http://www.indyweek.com/indyweek/durham-approves-body-cams-but-are-they-a-waste-of-money/Content?oid=5090991); Feb 04, 2016 Work Session.

[59] "Asset Forfeiture Program," Department of Justice, accessed December 05, 2016,

<https://www.justice.gov/afp>.

[60] Nov 10, 2016 Work Session.

[61] FADE's Facebook page.

[62] Nov 21, 2016 Meeting.

[63] J. Mitchell Miller and Lance H. Selva, "Drug Enforcement's Doubleedged Sword: An

Assessment of Asset Forfeiture Programs," Justice Quarterly 11, no. 2 (1994): 319.

[64] Ibid., 333.

[65] Virginia Bridges, "Mother of Man Fatally Shot by Durham Police Calls for Change," News

and Observer, last modified May 22, 2016, <http://www.newsobserver.com/news/local/community/durham-news/article79163542.html>

[66] "Durham Police Officer Involved in Fatal Shooting of Jose Ocampo Not Facing Charges,"

ABC11 Raleigh-Durham, last modified February 6, 2014,

<http://abc11.com/archive/9421822/>.

[67] Nov 21, 2016 Meeting.

[68] Ibid.

[69] See Ibid.; Feb 15, 2016 Meeting.

[70] Ibid.

[71] Nov 21, 2016 Meeting.

[72] William Lyons, The Politics of Community Policing: Rearranging the Power to Punish (Ann

Arbor: University of Michigan Press, 1999), 183.

[73] Brucato.

[74] Charles Goodwin, "Professional Vision," American Anthropologist 96, no. 3 (September

1994): 606, doi:10.1007/978-3-531-19381-6_20.

[75] Ibid.

[76] Nov 21, 2016 Meeting.

[77] Ibid.

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Ibid.



Vishnu Ramachandran is a sophomore from Atlanta, Georgia, majoring in Computer Science and Philosophy. To him, computer science revealed the hope of futuristic world driven by information technology, and his philosophy coursework made him question the ethics of ubiquitous computing. His interest in the intersection of technology and society, especially as it relates to smart cities and their social impact, stems from this contradiction. He wants to study not only urban informatics but also how to shepherd its mindful, intentional development.

FARC and Paramilitary Violence in Urabá, Colombia

by Luis González Chavez

The recent plebiscite in Colombia in October 2016 illustrated how an urban majority of voters can determine the result of a predominantly rural conflict. Furthermore, the plebiscite results largely resembled the geography of the war throughout the conflict. Certain regions of Colombia have been disproportionately affected, particularly those regions of vital geostrategic, economic, or military reasons. This paper focuses on how the region of Urabá was devastated by the armed actors throughout the conflict during the 1990s. I discuss the Revolutionary Armed Forces of Colombia (FARC) strategy in Urabá, as revealed in a clandestine guerrilla book titled *Documentos y Correspondencias de Manuel Marulanda Vélez: 1993-1998*. This primary source details the guidelines of the Strategic Plan and contains 1553 guerrilla documents written by Pedro Antonio Marín Marín, who took the name 'Manuel Marulanda Vélez.' The information revealed in the archive is monumental in our understanding of what occurred within the guerrilla during these critical years of expansion and heightened conflict. Additionally, I examine the origins of modern paramilitarism in Urabá, which dramatically transformed the history of Colombia. By the turn of the century, the surge in FARC and paramilitary strength led to a tragic deterioration of the conflict, in which vulnerable populations fell victim to countless human rights violations.

Keywords: Urabá, FARC, Marulanda, paramilitaries, geopolitics

Introduction

In the recent plebiscite on October 2, 2016, Colombians voted against a promising opportunity in the path towards achieving peace by not voting in favor of a peace agreement between the government and FARC. The campaign for the "No" vote won by a slight 50.2% margin. This outcome was a profound victory for the Democratic Center Party (Centro Democrático). Meanwhile, President Juan Manuel Santos and FARC negotiators failed to capture an auspicious occasion to finalize the accords. The results shocked the millions of Colombians that supported the agreements. Within days, thousands of people participated in peace marches in several cities, and similar manifestations were organized in Europe and the United States.

The plebiscite is a clear illustration of the political and social polarization in the country. It demonstrated how an urban vote could determine the result of a predominantly rural conflict. Thousands of voters in Bogotá, Cali, and Medellín voted against the agreements. These three cities have experienced a remarkable reduction of violence since 2010, unlike many cities in Putumayo or Caquetá, where armed actors are present in daily life.

The plebiscite results were different in rural areas, where most voters supported the peace accords. These regions experienced the most violence from the armed actors throughout the conflict. In Chocó, for instance, there was overwhelming support for the peace negotiations even though this department has been historically prone to FARC attacks. All 30 municipalities of the department supported the accords: in the community of Bojayá, about 95% of voters voted "yes."¹ This pattern can be traced in other regions that have experienced a disproportionate amount of violence throughout the conflict. Even though the FARC afflicted rural areas throughout the country, there was resounding support for the accords in these same areas. Evidently, the plebiscite results resembled the geography of war throughout the conflict. The immense support for the agreements in rural and conflict-driven areas illustrates how certain regions have been disproportionately affected.

The war was not the same in the wealthy, northern neighborhoods of Bogotá as it was in marginalized, rural communities, where the presence of the state is much weaker. Certain regions of the country were specifically targeted for geostrategic and political reasons. In particular,

the geographical region of Urabá became a battleground between the FARC, paramilitary groups, and the Popular Liberation Army (EPL).

This paper will examine the geopolitics of Urabá and highlight how the region experienced FARC and paramilitary expansions during the 1990s. The FARC, the ACCU, and the AUC paramilitary groups have occupied the region for various reasons. This period was characterized by a dramatic escalation of violence. These groups have been responsible for atrocious crimes, including several massacres, kidnappings, and political assassinations. These armed actors terrorized civilian communities and committed thousands of human rights violations.

Geopolitics of Urabá

The competing imaginations over the distribution of space in Urabá resulted in an atrocious episode of violence in the last three decades. The national government, leftist guerrillas, and paramilitary groups have visualized this region for their own interests. This history “is present in the memories and imaginations of Colombians as one of the most violent territories in the country.”² A territorial analysis of Urabá reveals how these opposing interests resulted in a perpetuation of the conflict.

Located in the northwest of the country, Urabá is a strategic corridor from the Atlantic to the Pacific Ocean. The region has an area of 11,671 km² in the Cordillera Oriental (West Andes), the first of the three branches of the Andes mountain region in Colombia.³ For centuries, this territory has been prized for the abundant biodiversity of flora and fauna it contains. The extensive region of Urabá spans three departments in Colombia: Córdoba, Antioquia, and Chocó. Urabá Antioquia, “within the larger region of Urabá, comprises “11 municipalities: Arboletes, Apartadó, Carepa, Chigorodó, Mutatá, Murindó, Necoclí, San Juan de Urabá, San Pedro de Urabá, Turbo, and Vigía del Fuerte.”⁴ As evidenced by its nickname, “the best corner in America,”⁵ this region is famous for its rich biodiversity and favorable climate.

The region has been prized for its tactical location throughout history. Since the 17th century, Urabá has been studied as the site of megaprojects, such as an interoceanic canal or a major highway linking the region.⁶ These projects would benefit financial capital and Colombian elites.⁷ Along with the canal, another notable development project is the construction of a commercial port known as Puerto Antioquia in Urabá.⁸ Also, the region has petroleum and coal deposits that have been largely sheltered as a result of the conflict. Overall, Urabá represents a vital economic center for the country.

The region stands out as an important “economic horizon with Asia and with the south of Colombia.”⁹ The *Seranía del Abibe* contributes to the geostrategic advantages of the region. This tropical forest is an important source of water for human settlement and it also provides a home to thousands of species. Furthermore, the region has been treasured for its proximity to the Gulf of Urabá and Pan-

amá: the “geological configuration of the region limits the potential damage from hurricanes.”¹⁰ The soil in Urabá is remarkably fertile and the tropical climate is suitable for commercial agriculture and cattle farming. Within Urabá Antioquia, the municipalities of Turbo, Apartadó, Carepa, and Chigorodó conform the *eje bananero*, an area home to hundreds of banana plantations.¹¹ Meanwhile, the municipalities of Necoclí, Arboletes, San Pedro de Urabá, and San Juan de Urabá conform the *eje ganadero*, the economic belt of cattle farming. Urabá also has immense cultural diversity since it encompasses several Afro-Colombian, Indigenous, and peasant communities. But in recent decades, the armed actors have targeted these marginalized populations.

Urabá has been home to numerous drug cartels, guerrilla insurgencies, and paramilitary groups. These organizations treasure the region because it represents a crucial location for cocaine trafficking. The favorable climatic conditions allow coca and poppy plantations to thrive: the proximity with Panama allows drug traffickers to export drug shipments to that country. During the 1990s, the region of Urabá experienced a remarkable rise in violence from the armed actors. The dynamics of the armed conflict transformed as a result of the ambitious military objectives of the FARC. In their aim to overthrow the Colombian state, the FARC intended to control Urabá as part of a larger effort to achieve their objectives.

FARC Strategy in Urabá

What was once a small, rural, and marginalized guerrilla, born from the infamous attack on Marquetalia in 1964, transformed into an increasing threat for the Colombian state. From 1960-1990 the FARC slowly modernized, trained, and expanded their battalions throughout the national territory. This group wears an identifiable camouflaged uniform with a patch of the Colombian flag that reads ‘FARC’ on the left arm. Many guerrilla fighters also dressed as civilians, especially in urban areas, which made it difficult for the armed actors to discriminate between combatants and noncombatants. Furthermore, during the 1990s, the FARC dreamt of a possible military victory at the height of their military power.

After the 8th Conference of the FARC in 1993, the guerrilla intensified their military offensive based on the Strategic Plan (Plan Estratégico). This ambitious strategy had been formulated during the 1970s.¹² The guerrilla book titled *Documentos y Correspondencias de Manuel Marulanda Vélez: 1993-1998* is an important source that details the guidelines of the Strategic Plan.¹³ This archive contains 1553 guerrilla documents written by Pedro Antonio Marín Marín, who took the name ‘Manuel Marulanda Vélez.’ Pedro Antonio Marín Marín was also known as *Tirofijo* (Sureshot) due to his excellent marksmanship. He directed the seven-member FARC Secretariat until his death in March 2008. Further investigation of this archive will reveal much of the internal structure of the FARC, along with its intricate relationship with the Colombian Communist Party during

the 1990s.

As of now, 43 of these documents have appeared in FARC computers that were confiscated by the Colombian Armed Forces.¹⁴ This archive appeared as a clandestine book destined for limited transmission within the FARC; it was never meant to reach the public.¹⁵ Similar to the archive of the late FARC Commander Luis Edgar Devía Silva, known by his *nom de guerre* 'Raul Reyes,' this unpublished FARC manuscript contains astounding information. Furthermore, this archive is a compilation of documents that "does not provide a comprehensive guide to all dimensions and details of FARC's international activity."¹⁶ Like other internal correspondences, the documents are "embedded in FARC beliefs, assumptions and interpretations."¹⁷ Nonetheless, this archive is a selective collection of astounding information. The FARC commander writes about the guerrilla strategy within the guidelines of the Strategic Plan. In several documents, Marulanda describes the importance of Urabá to the guerrilla strategy. This archive exposes the revisions to the FARC Strategic Plan during the 1990s, which resulted in the escalation of violence in Urabá. There are several correspondences that Marulanda writes to his Secretariat, seven of the highest-ranked commanders, in which he discusses this crucial region. While Marulanda was the top FARC commander, the rumors of a supposed installment of international organizations in Urabá, and the rise of paramilitarism in that region, posed major threats to the overarching guerrilla strategies.

On November 13, 1994, Marulanda writes a compelling letter to his Secretariat in which he evaluates the advancement of the Strategic Plan. This correspondence makes important revisions to this strategy. First, he writes about the Fifth Division in Cundinamarca as a central nerve of the military strategy: "We must remember that 50 percent of our forces should situate themselves in the center of deployment."¹⁸ Next, Marulanda states that the FARC should aim to become the political authority in several parts of the country. He says that while the guerrilla occupies certain regions, they allow some police officers to carry out their duties - the insurgency should act as a state. Marulanda declares that the FARC must expand in order to exercise authority over a large population. They must proclaim themselves as Provisional Government and exercise a "politics of the masses."¹⁹ There must also be an expansion of all guerrilla fronts in accordance to the Strategic Plan, which entails a general mobilization for the final offensive for power.²⁰

That the guerrilla increasingly participated in the drug trade meant that its dream for a military victory over the Colombian state could be successful. Throughout the 1990s, this guerrilla aimed to control the region of Urabá as a part of their Strategic Plan. Control over Urabá would allow the insurgency to expand its fronts and control the civilian population (as part of the politics of the masses). The FARC were well aware of the geostrategic and political importance of the region.

Through their correspondences Marulanda and Com-

mander Timochenko discussed the region of Urabá. The latter is the *nom de guerre* of Rodrigo Londoño Echeverri, a crucial member of the Secretariat during this period: he was responsible for FARC operations in the Magdalena Medio Bloc. In an internal correspondence on April 25, 1993, Marulanda orders Commander Timochenko to acquire a car with hidden compartments. This vehicle would be used to deliver ammunition for the "weapons that have arrived from Urabá."²¹ The weapons from the region could supply guerrilla battalions in other departments. Urabá was also crucial to the FARC for political reasons.

On March 31, 1994, Marulanda examines the repercussions of a possible independence of Urabá Antioquia. This rupture would allow the United States to "build an inter-oceanic canal and control the drug traffickers."²² Marulanda also argues that commanders from the Colombian Army are saying that they were attacked by 'narcoguerrillas' in every armed combat against the FARC. He claims that Colombian elites seek support from the United States in order to maintain power, due to the increasing victories of the guerrilla.²³

For the FARC, the region of Urabá had deep implications to its political strategy. Marulanda wrote several documents concerning the supposed installing of neutral zones in the region for international organizations; the escalation of massacres and the increased public attention to the violence in Urabá could instigate an international humanitarian intervention. On July 15, 1996, Marulanda writes to his Secretariat about a prominent issue concerning Urabá. Marulanda states that the FARC commanders must keep in mind these proposals: "Pax Christi, the International Red Cross, as well as representatives from the United Nations will be present."²⁴ As part of the interventions, "national, departmental, and municipal authorities will occupy the neutral zones." Marulanda argues that this proposal "demonstrates the great incapacity of the government and the complicity of high military commanders with paramilitaries; Urabá is where the most [paramilitary] troops are concentrated and they cannot explain why they do not fight these criminals."²⁵ The FARC leader warns his top commanders that international organizations will take advantage of the chaotic situation in Urabá, in order to appear as the saviors.

Marulanda particularly warns to prepare for a direct UN intervention against the revolutionary process of his guerrilla. He argues that these international organizations will intervene with the aid of the national authorities. "That has happened in other nations throughout history, which is why we must study the phenomenon," he writes.²⁶ All of these elements are outlined in the correspondence. It concludes with Marulanda urging his commanders to make a public announcement about this proposal. Marulanda questions whether the Secretariat should issue a public statement or if the Bloque José María Córdoba (a FARC bloc operating in Antioquia) should "elaborate a project".²⁷

Three days later, this proposal is also mentioned in a letter to the Secretariat on July 18, 1996. Marulanda informed

his commanders of a “material received via Raúl [Reyes].” It is an unsigned document that relates the proposition of prominent characters in national politics along with foreign governments. The Swedish, German, Spanish, Dutch, and Costa Rican governments, along with humanitarian international organizations, are willing to intervene in the region. Marulanda claims that this document does not call for the Colombian Government to assume its responsibility for the situation in Urabá, yet “the solution is in their hands.”²⁸ He also argues that the government’s real intention is to experiment with a long-term policy for other departments that will depend on its success or failure in that region.

Marulanda also discusses the region of Urabá on August 2, 1997 in a letter to Luciano Marín Arango, alias ‘Iván Márquez Márquez,’ and Noel Mata Mata, alias ‘Nariño’ or ‘Efraín Guzmán.’ Marulanda acknowledges that both guerrilla leaders have studied the situation in the region, and understand its significance to the revolution.²⁹ He orders Marquez and Nariño to exchange opinions about the situation in Urabá within the Bloques. The top FARC commanders must discuss the implications of petitioning international organizations to come to Urabá. Marulanda warns that these direct interventions can have disastrous, long-term results for the armed movement.³⁰

During this period the emerging paramilitary structures represented major threats to FARC interests in the region. On November 1, 1996, Marulanda writes to his Secretariat about a clandestine operation to assassinate Governor Álvaro Uribe Vélez, whom the FARC commander suspects of supporting these groups. The top FARC commander states that the Governor of Antioquia executed a dirty campaign against the guerrilla that included a “campaign of slander and the support of Convivir cooperatives in order to legalize paramilitarism in his department.”³¹ Marulanda warns that this paramilitary project could expand throughout the country if the results are favorable in Antioquia.

Furthermore, Marulanda expresses grave concern over Uribe’s actions as governor: “This person [Governor Uribe] has been agitating a dangerous policy for two years that puts the interests of Colombia at risk when he has had the nerve of petitioning an international intervention from the Blue Helmets.”³² Marulanda orders the potential of the “[Bloque] José María C. as an urban network, along with Bolivarian militias, civil friends, democratic organizations etc., under our influence, to work with us in order to assassinate (dar de baja, he writes) the governor.”³³ These remarkable correspondences of a clandestine plan to assassinate President Uribe, while he was governor of Antioquia, have aroused almost no commentary from Colombian academics, journalists, politicians, or citizens.

Overall, there was a remarkable escalation of the conflict in Colombia during the 1990s. The skirmishes between the armed actors and the rise in massacres resulted in catastrophe for the civilian population. In retrospect, the period from 1991 onwards “comprises the height of territorial and military might of the FARC.”³⁴ The guerrilla dreamed

of transforming its strategy into a war of positions (guerrilla de movimientos), but with limited success after the Battle of Mitú in November 1998. Meanwhile, paramilitary groups strongly react to the ambitions of the FARC Strategic Plan. These far-right, militant groups defended their own interests and strategies in the region of Urabá.

Paramilitarism in Urabá

Like the expansion of FARC forces, the consolidation of paramilitary structures during the 1990s resulted in the atrocious degradation of the armed conflict. The origin of modern paramilitarism in Colombia is traced to the late 1970s. During these years the M-19 guerrilla increasingly relied on kidnapping for its own political strategy and as a source of funding. When the M-19 kidnapped Martha Nieves Ochoa, the sister of Juan David Ochoa, Pablo Escobar convened a meeting at his estate in Antioquia. By capturing a daughter of the Ochoa family, who were integral leaders of the Medellín Cartel, the criminal organization decided to retaliate. The group they formed in December 1981 was called MAS (Muerte a Secuestradores), or ‘Death to Kidnappers.’ The criminals inaugurated the organization by using airplanes to drop threatening pamphlets throughout public areas in Antioquia.

The MAS responded to increasing guerrilla kidnappings by capturing “M-19 guerrillas, their associates, and probably innocent people captured by police, then delivered to MAS to torture and kill.”³⁶ Another paramilitary group surged at the end of Pablo Escobar’s criminal life. His enemies founded their own organization known as Los Pepes (Perseguidos por Pablo Escobar), which means ‘Persecuted by Pablo Escobar.’ Then, after Escobar’s death in December 1993, and with the subsequent end of Los Pepes, paramilitarism found a new home in the region of Urabá.

The government officially banned paramilitary structures, but groups known as Masetos, which were remnants of MAS networks, continued to terrorize several communities. Carlos Castaño, a young cattle rancher who had worked with MAS, established his “own version of MAS in the state of Córdoba, financed with contributions from cattle ranchers and business.”³⁷ The early experience of paramilitarism proved the efficiency of these organizations in weakening the guerrillas. With the help of his brother Fidel, and with millions of dollars from cocaine trafficking, a new paramilitary group was born. This organization was known as the ACCU or Córdoba and Urabá Peasant Self-Defense Group.³⁸ These groups were ideologically on the far-right, and they were counter-insurgent, irregular armies. They wore camouflaged uniforms, black boots, and an identifiable ‘ACCU’ patch on the side of their arms. An era of terror arose in Urabá.

The ACCU paramilitaries were commonly known as the Mochacabezas, meaning ‘Head Splitters.’ This new organization became famous as it used any means necessary in order to terrorize guerrillas and the civilian population. Robin Kirk writes a compelling description of the new paramilitary tactics in *More Terrible than Death*:

They mutilated bodies with chain saws. They chained people to burning vehicles. They decapitated and rolled heads like soccer balls. They killed dozens at a time, including women and children. They buried people alive or hung them on meat hooks, carving them. They threw their dozens of victims like damp and fly-blown trash to the side of the road.³⁹

The ACCU introduced a period of unbearable violence in the region of Urabá. They terrorized civilians with sexual violence, dreadful torture tactics, and by displacing non-combatant peasants. The ACCU waged war with the FARC and the EPL because this territory was crucial for all factions. If Castaño could drive out the guerrillas, his enemies would be compelled to use riskier drug routes for cocaine shipments to the United States. An ACCU victory in Urabá would also limit the FARC's "ability to tax cocaine shipments headed north and collect weapons and other war materiel headed south."⁴⁰

Meanwhile, the EPL guerrilla surrendered in 1991 in the region of Urabá and formed a political movement. Known as the Esperanzados, they became the targets of FARC attacks because many former EPL members ended up joining the paramilitaries. The Esperanzados retaliated against the Colombian Communist Party and the Patriotic Union (Unión Patriótica); both of these political organizations were indispensable to the political strategy of the FARC. The violence between the armed actors created an atrocious atmosphere in Urabá. Along with the incessant struggle for power between the FARC and the ACCU, the largest guerrilla was now at war with many former EPL members. By 1994, the homicide rate in Urabá rose to 245 deaths per 100,000 inhabitants.⁴¹ The worst was yet to come.

The nation entered a tragic chapter when Carlos Castaño transformed the ACCU into the AUC (Autodefensas Unidas de Colombia) in April 1997. Castaño united his forces in the regions of Córdoba and Urabá with the paramilitary structures in Magdalena Medio and the eastern region bordering Venezuela known as Llanos Orientales. The AUC utilized the same counterinsurgency tactics as the ACCU, and wore a similar uniform with an AUC patch on the side of an arm. Like the ACCU, this new group also wore camouflaged uniforms, the AUC were also known for wearing black, as they often had black boots, helmets, and black patches on their shirts.

As a federation of regional paramilitary groups, the AUC committed more than 1,000 massacres, forcibly displaced millions, and their alliance with politicians in several regions led to the expansion of paramilitary forces throughout the country.⁴² Furthermore, the political leaders of the region could not save their communities from the wave of new violence. Many have criticized the government for its role in the surge of paramilitarism. In particular, Gloria Cuartas strongly condemned former President Álvaro Uribe Vélez for the expansion of paramilitarism while he was Governor of Antioquia from 1995 to 1998.

Cuartas was mayor of Apartadó from 1995 to 1997 and

has since become a vocal opponent of the former president. She affirms that, since 1962, and through different names, paramilitary structures have been active in Urabá.⁴³ These groups rose in response to the increasingly ambitious FARC objectives. Furthermore, in a televised interview with Óscar Bustos, Cuartas declared, "Álvaro Uribe Vélez is responsible for the conformation of paramilitary structures in the region of Urabá."⁴⁴ She has pursued these powerful declarations in the Colombian justice system but without any prominent advancement.

Cuartas claims that Uribe, along with Carlos Castaño, General Rito Alejo Del Río, and Pedro Juan Moreno, are responsible for the surge of paramilitarism in the region of Urabá. While Uribe was governor, his top commander in the region was General Rito Alejo Del Río. The former general "worked in alliance with paramilitary commanders: alias 'HH,' alias 'El Alemán,' the infamous Salvatore Mancuso, and alias 'Don Berna.'"⁴⁵ Cuartas claims that they all shared the same objective of defeating the guerrillas. Effectively, Cuartas' declarations against Uribe have been met with strong criticisms from the Democratic Center party. She argues that her testimony illustrates the indifference and complicity of the Colombian state for the rise of paramilitarism.

While Uribe was governor of Antioquia, 77 convivir groups were established. These self-defense groups transitioned to criminal organizations and were responsible for kidnapping, extortion, and drug trafficking.⁴⁶ Uribe promoted and defended the convivir groups. He also defends his friendship to General Rito Alejo Del Río.⁴⁷ The latter was a 1967 graduate of the U.S. Army School of the Americas and his links to paramilitary groups became evident by August 1998, when "Colombian prosecutors had opened a preliminary investigation of the general's ties to paramilitaries."⁴⁸ Del Río worked in alliance with paramilitary groups while he commanded the 17th Brigade of the Colombian Army. Del Río's success against insurgents in the region of Urabá allowed him to stay as a commander for two years, which is unusual for brigade commanders. A United States Embassy cable from August 13, 1998 states "his systematic arming and equipping of aggressive regional paramilitaries was pivotal to his military success at the time."⁴⁹

Cuartas also argues that the "observatory for the politics of democratic security has its roots in the geography of war in the region of Urabá."⁵⁰ She argues that Uribe "demonstrated that it was necessary to invest in war in certain regions of the country."⁵¹ She also argues that these visible paramilitary structures could not have operated in the region of Urabá without their complicity with the 17th Brigade.

Furthermore, while former President Uribe has never been found guilty of links to paramilitary groups, as Cuartas claims, he has "publicly embraced notorious thugs, among them General Del Río."⁵² Robin Kirk criticizes Uribe's actions when he "remained silent as his advisers publicly attacked Apartadó mayor Gloria Cuartas as a secret guer-

rilla supporter.”⁵³ For many years, Cuartas’ political enemies have claimed she was part of the Fifth Front of the FARC; these declarations have never been proven in a court of law.⁵⁴ Ultimately, the violence and polarization between guerrillas and paramilitary groups resulted in one of the darkest periods in Colombian history.

The 1990s were prominent years of both FARC and paramilitary expansions throughout the region of Urabá. By 2002, the largest guerrilla comprised more than 20,000 members, and “the AUC had 12,000 members (and was swiftly increasing).”⁵⁵ These years changed the history of Urabá, as thousands of innocent civilians became victims of the increased violence.

Human Rights in Urabá

This episode of violence left a scarring wound in the social fabric of the country. There have been 467,744 victims from the armed conflict in Urabá. Correspondingly, 79,754 persons from this region have been victims of forced displacement, homicide, and/or a lack of medical attention.⁵⁶ During these years, the expansion of both FARC and paramilitary troops led to an increase in human rights violations.

The FARC guerrilla imposed atrocious actions on the civilian population. The guerrilla kidnapped civilians, police officers, military personnel, and politicians throughout the armed conflict. This practice generated large tracts of revenue and illustrated the military power of the guerrilla. “Kidnapping involves many aspects of a human rights drama, which often begins with the risks of the operation itself, in which victims are torn from their natural, professional, and family environments.”⁵⁷ Female captives would often be raped and many captives would be forcibly tied or chained together. Some captives were deprived of their freedom for several years. The kidnapping of presidential candidate Ingrid Betancourt, who was later rescued in 2008, was a striking reminder that the guerrillas posed a constant threat to civil and democratic institutions. As a result, about 250 FARC members, including eight members of the FARC Secretariat, have been condemned for crimes against humanity.⁵⁸

Some FARC insurgents have committed numerous crimes of sexual violence, including against minors and many of their own female soldiers. The organization perpetuated violence against women through an abortion policy established by the FARC Secretariat. Pregnant soldiers in combat positions were often forced to abort — this led to more than 1,000 forced abortions. The FARC also recruited about 2,000 children to the guerrilla movement, denying them of their human rights.⁵⁹ Ultimately, the FARC justified their insurrection with the promise of improving the daily lives of peasants and achieving social justice for marginalized groups, but the guerrilla failed to achieve the necessary popular support because it terrorized innocent non-combatants throughout the conflict. The strategy of a strong ‘politics of the masses’ was incompatible with the

human rights violations that guerrilla forces would inflict on several communities.

Meanwhile, the overarching objectives of the ACCU and the AUC were to expel FARC combatants from their regions of influence. Unlike the FARC, these far-right groups did not plan to overthrow the state, and they were not as rooted ideologically. “With time and the collapse of Communism, the dynamic of the self-defense groups, as with the guerrillas, became less an ideological product and more a pragmatic one involving struggles for territory and resources.”⁶⁰ The paramilitary groups also committed numerous massacres against the civilian population in Urabá. From October 1995 to September 1996, the ACCU committed 32 massacres, while the FARC was responsible for 13.⁶¹ These actions resulted in a powerful consolidation of paramilitary structures through the ‘eje bananero’ and the southern regions of Urabá.⁶² Overall, FARC and paramilitary groups were responsible for sexual violence, forced displacement, massacres, kidnappings, and forced conscription. Most victims of the violence in Urabá migrated to the large cities of Medellín, and Montería, which were “large enough to guarantee a certain degree of anonymity for the displaced families.”⁶³

Transition to Post-Conflict

During the decade of 1990, the expansion of FARC and paramilitary forces in Urabá created a deplorable situation for the marginalized communities of the region. But in recent years, with the vast reduction in violence, there are more favorable opportunities to recover the truth of the armed conflict. Recently, the FARC claimed responsibility for the heinous acts they committed in Urabá throughout the conflict. In particular, they recognized their blame for the notable massacre in the neighborhood of La Chinita in San José de Apartadó where 34 innocent people were murdered.⁶⁴ Top FARC commanders asked the community of San José de Apartadó for forgiveness in a symbolic ceremony in September 2016. This joint ceremony also involved representatives from the Colombian government and dozens of victims and survivors from the community. However, these efforts have limited effects at dignifying the victims and calling attention to their needs. A perpetual peace is achieved when the national government takes extraordinary efforts to guarantee non-repetition, truth, and justice for the victims of the conflict. Investments in education, healthcare, and land reform will improve the lives of many Colombians in the post-conflict.

Furthermore, although the recent plebiscite delayed the peace accords from being implemented, there is cause for optimism. On October 7, 2016, President Santos received the 2016 Nobel Peace Prize for his efforts towards consolidating peace in Colombia. This latest development illustrates the enormous international pressure for a renegotiation of the peace accords. The Colombian government and the ELN guerrilla will also draft, negotiate, and implement a similar peace agreement. In the last three

months, Colombians have undergone political alterations that will shape the course of the nation in the 21st century. The communities that have been most affected throughout the conflict will see remarkable developments in the aftermath of these peace agreements.

Works Cited

1. Vanesa Restrepo, "En Bojayá El 95 Por Ciento De La Gente Votó Por El Sí" (El colombiano, Oct. 2, 2016).
2. Juan Ricardo Aparicio Cuervo, "Rumors, residues and governance in the 'best corner of South-America: A grounded history of the 'human' limit in Colombia," (PhD diss., University of North Carolina at Chapel Hill, 2009), 6.
3. Julián Penagos Carreño, "La construcción de la memoria de un lugar en la prensa. Urabá en la Revista Semana (1980-2002)," *anagramas rumbos sentidos comun*, Vol.9, N.18: 2011.
4. ACNUR. "Algunos indicadores sobre la situación de los derechos humanos en la Región del Urabá Antioqueño," (ACNUR, 2004).
5. Aparicio, "Rumors, residues," ix.
6. *Ibid.*, 48.
7. *Ibid.*, 198-199.
8. Cuartas, Gloria. "Critical geopolitics of the Urabá." *Criterio Jurídico Garantista*, 7(12), (2015): 107.
9. *Ibid.*
10. Aparicio, "Rumors, residues," 6.
11. ACNUR. "Algunos indicadores sobre la situación."
12. IISS London, *The FARC Files: Venezuela, Ecuador and the Secret Archive of Raúl Reyes*, (International Institute for Strategic Studies, 2011), 25.
13. FARC-EP, *Documentos y Correspondencias de Manuel Marulanda Vélez, 1993-1998*, (Unpublished manuscript, circa 1999).
14. *Semana*, "¿Las Farc Asesinaron a Álvaro Gómez?," *Semana*, Sept. 1, 2012.
15. José Obdulio Gaviria, "Las Cartas De 'Tirofijo,'" *El Tiempo*, July 17, 2012.
16. IISS London, *The FARC Files*, 20.
17. *Ibid.*, 21.
18. FARC-EP, *Documentos y Correspondencias*, 489.
19. FARC-EP, *Conclusiones Pleno del Estado Mayor Central. Líneas generales del plan militar estratégico de 8 años*. July 1989-1997, May 1989.
20. FARC-EP, *Documentos y Correspondencias*, 493.
21. *Ibid.*, 163.
22. *Ibid.*, 580.
23. *Ibid.*
24. *Ibid.*, 676.
25. *Ibid.*
26. *Ibid.*
27. *Ibid.*, 677.
28. *Ibid.*, 680-681.
29. *Ibid.*, 698.
30. *Ibid.*
31. *Ibid.*, 768.
32. *Ibid.*
33. *Ibid.*, 769.
34. CNMH. *Guerrilla y Población Civil: Trayectoria de las FARC 1949-2013*, (Bogotá: Centro Nacional de Memoria Histórica, 2014), 173-174.
35. Robin Kirk, *More Terrible than Death: Violence, Drugs, and America's War in Colombia*, (PublicAffairs, 2003), 105.
36. *Ibid.*, 106.
37. *Ibid.*, 143.
38. *Ibid.*, 142.
39. *Ibid.*, 144.
40. *Ibid.*
41. *Ibid.*, 159.
42. Luis Carlos Restrepo Ramirez. *Justicia y Paz: De la negociación a la gracia*, (Instituto Tecnológico Metropolitano, 2005).
43. Gloria Cuartas, "Critical geopolitics of the Urabá."
44. Gloria Cuartas, "Hagamos Memoria: Denuncias de Gloria Cuartas, exalcaldesa de Apartadó sobre masacre paramilitar," Personal interview with Óscar Bustos, (Canal Capital Bogotá, 18 Jan. 2013).
45. *Ibid.*
46. Robin Kirk, *More Terrible than Death*, 282.
47. Álvaro Uribe Vélez, "¿Por qué soy paramilitar?" *Las2orillas*, Sep. 9, 2013.
48. U.S. Embassy Colombia cable, Bogota 9345. "General Ramirez Lashes Out at State Department; Two More Generals Under Investigation for Paramilitary Links," (13 Aug. 1998).
49. *Ibid.*
50. Gloria Cuartas, "Hagamos Memoria."
51. Gloria Cuartas, "Critical geopolitics of the Urabá."
52. Robin Kirk, *More Terrible than Death*, 280.
53. *Ibid.*, 281.
54. Gloria Cuartas, "Hagamos Memoria."
55. Robin Kirk, *More Terrible than Death*, 218.
56. Red Nacional de Información, "Registro Único de Víctimas," (8 Dec. 2016). <http://rni.unidadvictimas.gov.co/RUV>
57. Charles Bergquist, Ricardo Peñaranda, and Gonzalo Sánchez. *Violence in Colombia, 1990-2000: Waging War and Negotiating Peace*, (Scholarly Resources, 2001), 18.
58. *EL TIEMPO*. "Los Peores Crímenes En El Prontuario De Las Farc - Proceso De Paz," *El Tiempo*, Sept. 26, 2016.
59. *Ibid.*
60. Bergquist et. al, *Violence in Colombia*, 21.
61. *Ibid.*
62. Clara García, "Urabá: políticas de paz y dinámicas de Guerra," *Estudios Políticos*, (Vol. 10,
63. 1997), 146.
64. Bergquist et. al, *Violence in Colombia*, 160.
65. Redacción Política. "La Ruta Del Perdón De Las Farc." (*El Espectador*, 12 Sept. 2016). <http://www.elespectador.com/noticias/politica/ruta-del-perdon-de-farc-articulo-654406>



Luis González Chavez is part of the Colombian Diaspora in the United States and is determined to study the armed conflict that forced him to leave his home. Like millions of other Colombians, the armed conflict has affected his family for generations. His interest in Latin America dates back to his childhood years when his family would have passionate political discussions about the war.

He recently graduated from UNC-Chapel Hill in December 2016. He received his Bachelor of Arts in Political Science and Latin American Studies, along with a Minor in History. Additionally, he took part in two research projects at UNC, learning about health conditions in the United States Latina/o population and Cuban permaculture farming, respectively. During his undergraduate education he studied abroad at the University of Montevideo in a year long exchange program. He also received the Halpern Award from the Institute for the Study of the Americas.

He is currently an M.A. candidate in Latin American Studies at the Edmund A. Walsh School of Foreign Service at Georgetown University. His concentration at the Center for Latin American Studies is Conflict Resolution and Human Rights. Furthermore, he is pursuing a Certificate in Refugees and Humanitarian Emergencies from the International Institute of Migration at Georgetown University. Along with his studies, he works as a Latin America Initiative Fellow, assisting an anthropology research project that focuses on internally displaced persons in Colombia.

Barriers to Treatment: Colorblindness and Eating Disorders for Black Women

by Alexis Roane

Research shows that eating disorders do not discriminate by race, gender, age, socioeconomic status, size, sexuality, or gender expression. Nonetheless, in practice, there is clear discrimination against patients of color amongst relevant professionals (e.g. clinicians, nutritionists, and psychologists) in their diagnoses and treatment plans. Given the increasing presence of women of color, specifically black women, at predominantly white undergraduate institutions of education, it is important to illuminate the extent to which these professionals who interact with students of color account for cultural sensitivity in diagnostic criteria. To investigate, I conducted a series of face-to-face, semi-structured interviews with professionals (e.g. clinicians, nutritionists, and psychologists) at a large public southern university. They were queried about the services they provide with hopes of discerning whether racial and/or ethnic bias was present in the way they tackled the prevalence of eating disorders amongst female college students of color. This paper highlights the socio-cultural barriers that black women are likely to face in their path toward treatment, and can also serve as a means of opening conversations about how the color-blind nature of eating disorder research and treatment affects women of color.

Keywords: eating disorders, predominantly white colleges, black women, discrimination

Introduction

The American Psychiatric Association defines an eating disorder as an illness whereby people experience severe disturbances in their eating behaviors as well as related thoughts and emotions, typically becoming obsessed with food and their body weight (Brownell et. al., 2011). The National Eating Disorder Association (NEDA) states that with the exception of anorexia nervosa, the prevalence of reported eating disorders is similar among Non-Hispanic Whites, Hispanics, African-Americans, and Asian Americans in the United States ("Research Results"). Additionally, approximately 90% of those diagnosed with eating disorders are women (Joseph, 2001), but the implicit association between race, gender, and eating disorders happens for a reason: in popular media, one is bombarded with images of thin, young, white women who struggle with eating disorders (Root, 1990). Even WebMD, an online publisher of news and information related to human health and wellness,

provides an informative slideshow related to eating disorders, diagnosis, and treatment, using only images of white women. Similarly, when one Google searches 'eating disorder' Google Images reveals a plethora of images with people that are overwhelmingly white and overwhelmingly female¹. Given the equal prevalence of eating disorders among women across racial groups, what are the implications for women of color with eating disorders if eating disorders (EDs) are primarily, or even exclusively, perceived as a white woman's issue by medical and mental health professionals?

Eating disorders tend to fall under four different categories--anorexia nervosa, bulimia nervosa, binge eating disorder and Other Specified Feeding or Eating Disorder (OSFED). Anorexia nervosa involves a person restricting their caloric intake to extreme lengths, fearing weight gain, and exhibiting a significant disturbance in perceptions of the shape and size of his or her body (Parekh 2015). Bulimia nervosa involves a person engaging

in the cycle of binge eating an excessive amount of food in a small amount of time, experiencing guilt and feelings of losing control, only to be followed by compensatory behavior such as purging² (Parekh 2015). Binge eating disorder is similar to that of bulimia nervosa, but no purging is involved; eating excessive amounts of food in a small time frame which both a sense of relief as well as guilt (Parekh 2015). According to the National Eating Disorders Association (NEDA), OSFED is defined with the intentions of being a ‘catch-all’ for disordered behaviors that do not neatly fit into the specified categories of the other disorders listed above (“Other Specified”). Some disorders under this classification include purging disorder—the use of purging without binge eating—and orthorexia nervosa—the development of an obsession with healthy behaviors, typically expressed through restricting ideas of what is “good” and “bad” food. It is not uncommon for all of these behaviors to be experienced in combination with other mental health issues such as anxiety, Post-Traumatic Stress Disorder (PTSD), depression, bipolar disorder, and Obsessive Compulsive Disorder (OCD)—to name a few.

Eating disorders are complex psychological disorders that can be best expressed as a “loaded gun” because they do not become truly harmful until the trigger is pulled. Eating disorders have many components to them; genetics, low self-esteem, body image issues, and biological processes can be described as the bullets for the gun. The harm is not done, however, until the environment pulls the trigger (Bulik, 2010). Triggers include socioeconomic status, cultural understandings of health and the body, economic and political policies, desire for control following a traumatic experience (such as rape, sexual assault or domestic violence), and various other social systems at play (such as sexism, racism, ableism, ageism, classism, transmisogyny and heteronormativity).

College campuses in particular provide unique risk factors for eating disorders. Anorexia affects 0.6% - 2% of college women and 0.2% -1.1% of college men, and bulimia affects 3%-14% for women and 0.02% -0.2% for men (Iarovici, 2014)³. Some distinctive risk elements of college campuses include: excessive stress, the prevalence of rape and sexual assault, dining hall culture, binge drinking, and the cultural lexicon of “the freshman 15”⁴. When these environments are added to the already problematic stigma of associating eating disorders with whiteness, where does this leave women of color on college campuses with a largely white population? My research will attempt to answer these questions by conducting a qualitative study to analyze the extent to which local professionals—nutritionists, psychiatrists, clinicians, and researchers—intended to support those suffering from an eating disorder have bias.

Literature Review: Barriers to Treatment

Historical Exclusivity of Medical Research

Research on eating disorders and disordered eating as psychological disorders and subsequent behavioral disorders

came into focus when the first Diagnostic and Statistical Manual of Mental Disorders (DSM) was published in 1952⁵. Similar to most medical research of that era, communities of color were excluded from research studies as patients in favor of solely conducting medical research on the “standard” human—a white, male, middle-class American (Epstein 2007). Creating a one-size-fits-all medical research system based on middle class, middle-aged white men had various implications. First, this skewed medical research operated under various assumptions about standards of humanity that are racist, ableist, classist, sexist, homophobic, and ageist in nature. Second, medication generated from this medical research had the potential to be harmful to untested populations. For example, some of women’s biological processes differ from men and their bodies tend to produce different symptoms for the same diseases. In his 2004 article, “A Radical Idea: Men and Women are Different”, Doug Bowles investigates the sex differences in the pathology of hypertension as a way of opening up larger conversations about gender-based biology. Children, whose bodies haven’t fully developed yet, can also have harmful reactions to the medicines being produced in a limited and narrow context of certain white men’s lives (Stephenson, 2005). Lastly, the research-to-policy pipeline—the process by which (medical) research influences related and relevant policies—only reaffirmed these limited notions of who can suffer from different diseases and illnesses and how they experience them. As a result, marginalized groups were further excluded from clinical trials, diagnoses for illnesses, and any subsequent financial aid, such as insurance coverage, in dealing with these illnesses.

“Protection” and Beauty Standards

Of the few studies that actually included black women in eating disorder research, the research ironically served to reinforce that exclusion by asserting that black women’s culture “protects” them from developing eating disorders (Hesse-Biber 1996, 63). Beth L. Molloy and Sharon D. Herzberger (1998) conducted a study to determine the relationship between race, ethnicity, and class with both women’s perceptions of themselves and their bodies. They found in their research that African-American women reported higher levels of self-esteem and a more positive body image than white women, that African-American women reported possessing more masculine traits and that African-American women perceive men of their race to prefer larger, full-figured women. Molloy and Herzberger (1998) subsequently concluded that these perceptions act as “protective factors” from negative body image for black women. Specifically, they claim, “To the extent that African-American women identify more with their racial/ethnic culture than with the dominant culture and to the extent that they interact mostly with other African-Americans, they may be ‘protected’ from white norms regarding body styles” (633). It should be noted that the authors present very constrained conditions under which “protection” occurs; there is an implied assumption that simply

because black women interact with a different subculture within the black community, that they will not be equally affected by dominant American culture.

There also lies the acknowledgment that dominate American culture (language, arts and literature, customs, social norms and values, etc.) is embedded in white standards (Guess, 2006). In her 1998 article, Lisa Williamson affirms that belonging to a culture that is more accepting of different body types and sizes has led many medical researchers and research psychologists to suggest that black women are not as affected by mainstream western beauty ideals as white women are. Similarly, Susan Bordo (1993) claims that “to imagine that African American women are immune to the standards of slenderness that reign today . . . is to come very close to the racist notion that the art of glamour. . . of femininity belong to the white woman alone” (63). Williamson takes it one step further in mentioning that the idealization of mainstream Eurocentric beauty standards in America have usually existed in conjunction to the denigration of black traits as a form of “othering” black women and excluding them from this paradigm. For example, Hesse-Biber (1996) states, “Blue-eyed, blond, thin, white women could not be considered beautiful without the Other—Black women with classical African features of dark skin, broad noses, full lips and kinky hair” (111). However, in critiquing this Western beauty standard, Hesse-Biber ironically reinforces these standards. Williamson, on the other hand, asserts that awareness of black stereotypes in conjunction with constant subjection to the mainstream white ideal can have a critical effect on black women’s body image in ways that are equally harmful as white women’s body image issues.

This false notion of protection, however, influences not only research, but medical professionals as well, often leading to the under diagnosis and misdiagnosis of African-American women and other women of color with eating disorders (Clark, 1972; Dolan, 1991). Carly Thompson and Sinyoung Park (2016) found that minorities, including African Americans, Asians, and Latinos, were 50% less likely than their white counterparts to receive a recommendation to see a health professional who specializes in eating disorder treatment during a screening by clinicians, even though the eating disorder symptomatology did not differ among groups (only 30% of minorities were recommended to see a health professional in comparison to the 60% of whites who were recommended).

According to Gordon (2010), regardless of ethnic background, all women included in the study (Black, Latina, and White) were exposed to mainstream American body ideals, mainly through various forms of media—thus, exposing them to Naomi Wolf’s coined term, the beauty myth. In her book, *The Beauty Myth: How Images of Beauty are Used Against Women* (1991), Wolf states that beauty is falsely presented as static and universal. Only allowing a select group of people to fit into that paradigm of young, white, thin, cisgender, able-bodied, heterosexual, middle-to-upper class women, fuels a structure of inequality and

invalidation. For women of color who strive toward that mainstream cultural ideal, there is an inherent understanding that no matter what is done, they will never be considered beautiful (and therefore valuable by patriarchal standards) or accepted in context of a larger society that normalizes whiteness and white experiences (Green, 1994; Walker, 2014).

Acculturation, Coping Mechanisms, and Stereotypes

Recent studies focusing on patterns of disordered eating for women of color have shifted towards the role acculturation has played in Latina women and their risk for developing the disorder (Chamorro, 2003). Acculturation, in this specific context, is defined as a process of attitudinal and behavioral change undergone by individuals who reside in multicultural societies or who come in contact with a new culture, usually in an attempt to balance both of the various cultures they experience (Marin, 1992). The association of acculturation solely with immigration status in research studies has subsequently reinforced the false notion that African-American women do not experience acculturation, let alone acculturative stress. Acculturative stress in this context refers to the psychological distress that occurs during the process of adapting to a new culture (Smart, 1995).

African-Americans’ longstanding existence in America, not one that can be characterized by immigration, but rather, forced displacement through slavery, muddles the idea of what it means to adapt to a new dominant culture through the lens of acculturation⁷. For black people, acculturation is a daily battle, whether through adjusting one’s hair or vernacular to appear to be more “professional” (Opie and Phillips, 2015), or dealing with the balance of prayer and religion in lieu of psychotherapy when dealing with mental health issues (Neighbors and Jackson, 1996). This missing link between acculturation and acculturative stress in the black community within eating disorder research leaves many professionals without a meaningful understanding of the conditions in which black women experience their eating disorders. Few studies have been conducted on this unique stressor by psychologists and medical professionals when they consider how great the role subculture plays in current body perception as well as body ideals for black women—and what black women are willing to do to close that gap. However, Gordon (2010) demonstrates emerging interests on the subject; she concludes from her study that black women’s acculturative stress more so than acculturation itself acted as a risk factor for disordered eating symptoms. None of these studies, however, take into account the amount of acculturation that takes place when transitioning from high school to a predominately white college environment, and the culture that ensues in that space.

Black women were also found to cope with bulimic behaviors as a function for escape behaviors, or a way of escaping from their heightened sense of self-awareness (Heatherton, Baumeister, 1991). People who binge-eat suffer from high standards and expectations as well as

a severe sensitivity to the difficult (perceived) demands of others (Heatherton, Baumeister, 1991). When they fall short of these standards, they develop an aversive pattern of high self-awareness, usually through unflattering views of themselves and concern about how they are perceived by others. These feelings are accompanied by emotional distress, such as anxiety and depression, which are then relieved temporarily through binge eating. This logic can be applied to instances of bulimia with black women as they navigate their own heightened sense of self-awareness through racialized sexism.

More generally, various new studies on the Strong Black Woman (SBW) stereotype have also been helpful in dissecting the ways in which black women deal with and recognize mental health issues. The SBW framework details the racialized perception of black women being tough, strong, communal, and caring in nature (Donovan; Romero, 2000; Harris-Perry, 2011). West (2016) uses an intersectional and multidisciplinary approach to detail the paradoxical role that the SBW framework has played in black college women's emotional and mental well-being. Of the 78% of black women in West's study who had positive associations of the SBW framework, 57% of the same women reported the negative effects and challenges that it has had with regards to their mental health and their feelings of isolation. They also reported not being able to ask for help from others as well as being expected to cope with traumatizing events by themselves. West concluded by asserting:

"The internalization of strength, up to a certain point, may provide some protection against the psychological and physical outcomes of stressful events, including experiences of racism and sexism. At the same time, being perceived as strong and tough can limit Black women's access to services, support, and justice as a result of these attribution errors (Donovan, 2011; Donovan & Williams, 2002) and, simultaneously exacerbate symptomatology and feelings of shame in response to these negative perceptions (Harris-Perry, 2011)" (392).

Counseling and Psychological Services on College Campuses

Numerous studies have also highlighted the taxing environment of Counseling and Psychological Services (CAPS) that exacerbates the current barriers to treatment for women who struggle with eating disorders. Many counseling centers at colleges are so overburdened and understaffed that less than 20% of college students who have screened positive for EDs have actually received treatment (Wifley, Agras, and Taylor, 2013). Given that eating disorders in general are a salient issue on college campuses, the fact that few colleges actually have the appropriate resources to support the complex needs of those suffering from an eating disorder is concerning.

In February of 2013, NEDA published a study "Eating Disorders on the College Campus: A National Survey of Programs and Resources" to outline available resources for college students suffering from an eating disorder. Of the 163 Universities and Colleges surveyed: only 47.9% of the institutions have an on-staff nutritionist with an eating disorder specialization, and only 22% of representatives said their campus offers opportunities for coursework or special training opportunities for dietitians, fitness instructors, and the like to identify and refer people with warning signs. Additionally, only 24% of representatives offered therapy groups for students with eating disorders on a weekly basis. Lastly, 54.8% of representatives were not aware or do not offer campus-wide screenings for eating disorders (Levine et. al. 2013).

Lack of adequate resources for support with those suffering from an eating disorder is already an issue without addressing the complexities of support needed for black women. Given the fact that college enrollment growth rates from 1973-2005 rose to 62% for black men and 275% for black women, their increased presence on predominantly white campuses necessitates a more nuanced examination of their eating disorder experiences (National Center for Education Statistics [NCES], 2007). Many studies conducted on patterns of disordered eating amongst black female college students, however, stressed the importance of having not only specialized training for existing professionals (clinicians, psychiatrists, therapists, and primary care physicians), but an increase in diversity amongst these professionals to be more inclusive of black female professionals as a means of accommodating the needs of black women with eating disorders (Donovan and West, 2014, West et. al. 2016).

The Missing Pieces of Current Research

Despite contributions from existing literature, we still have a void in our knowledge concerning the following connections and ideas. First, the SBW framework has not been applied directly to instances of disordered eating. Most of the few studies conducted on the SBW framework have sought to seek correlations with mental health and emotional well-being (Donovan, 2011; Donovan & Williams, 2002; Harris-Perry, 2011; West, 2016). The research done on the relationship between the SBW framework and eating patterns amongst black women has traditionally been through the lens of Thompson's (1994) term, 'eating problems.' Thompson (1994) emphasizes the importance of shifting the conversation away from 'eating disorders' (an individual psychological perspective) to 'eating problems' (relationships with food that rely on a larger analysis of the social systems that influence said relationships) with hopes of being more inclusive and broad about the problematic society that is projected onto women's relationships with food in the first place. However, focusing on the relationship of the SBW framework to 'eating problems' and not instances of 'disordered eating' serves to only reinforce a lack of practical support for black women with

eating disorders because the context of the first term does not necessarily see the disordered eating patterns as the cause of health problems for black women. The framework solely focuses on larger injustices that influence these black women's lives. So while the 'eating problems' framework is necessary to better contextualize black women's experiences with eating disorders, it also necessitates an alternative form of treatment for 'eating problems'. This alternative would need to be practical and immediate as opposed to necessitating the dismantling of the systems of oppression that dictate black women's lives in the first place. The eating disorder framework and the eating problem framework must instead work together to create practical treatment for black women that is thoroughly culturally sensitive to the unique conditions that shape many black women's experiences with disordered eating.

Similarly, Tamara Beauboeuf-Lafontant (2009) argues that the problematic language of 'eating disorders' in medical literature has reinscribed "particularly white women within a set of stereotypically feminine traits such as malin-gering and self-absorption" (50). 'Eating problems', on the other hand, lend way to a more historical analysis in understanding the current relationships that poor women and black women (or both) have with food. Thompson (1994) argues that differing systems of oppression such as racism, sexism, and classism have generated unique stress in the black community, especially poor black women who, for various reasons (such as the disproportionate mass incarceration of Black people and the SBW framework to name a few), have been expected to be pillars of their community.

Second, the language surrounding eating disorder diagnostic criteria has been found to use gendered language, and subsequently, has correlated to higher rates of eating disorder diagnoses among women as opposed to men (Reslan and Saules, 2011). This logic, however, has not been applied to the implicit and explicit cultural or racial bias surrounding language used in the 5th edition Diagnostic and Statistical Manual of Mental Disorders (DSM-V). In fact, up until the release of the DSM-V in 2013, one of the most common eating disorders found in black women (Binge Eating Disorder) was not even considered to be an eating disorder, but rather, it was diagnosed under Eating Disorders Not Otherwise Specified (the former name for OSFED) ("Highlighting Changes"). This significant oversight had and continues to have a large role in the under-diagnosis of black women with eating disorders because it was harder to diagnose and get insurance coverage for the experiences that many black women with disordered eating had.

Given these conditions, eating problems in conjunction with the SBW framework have historically been and continue to be a channel for "safety and healing in those bodies on which so much violence is inflicted" (Beauboeuf-Lafontant, 2009, p. 50). Black women are more likely to binge than to use alcohol for this channel because food acts as a cheaper temporary solution that still allows them

to perform their responsibilities within the black community—economically, familially, and emotionally. Thus, this shift in language allows one to challenge the hegemonic view of eating disorders as a negative plight of the middle to upper-class white female community. Instead, eating problems—while they do have consequences in it of themselves—are seen in a more complex manner, particularly as a way:

"to counteract violence, gain security, and create pockets of freedom. Whether engaged in bingeing, purging, or self-starvation, women with eating problems are clamouring for recognition and protection within a society and amidst cultural norms that systematically ignore them and dismiss them because they are expendable, because they are "just women"" (Thompson 1994, 51).

Notice, this definition allows the role of violence against women (ranging from domestic and sexual violence to catcalling) to play a more appropriate role in the development of eating problems by acknowledging the more complex ways in which women's bodies are treated in society beyond the pressure to attain a specific feminine identity. In a featured piece for *Essence*, former editor of The New York Times Book Review Rosemary Bray (1992) delves into the deeper meanings and implications for women in the black community through a lens of her own struggles with eating problems:

"Black women have assumed so much responsibility in this culture I often wonder how we can still stand up. Who and what supports us? In truth, it is most likely food that sustains us...we are forever working, loving, volunteering, scolding, nurturing, and organizing — but nearly always for others. And we do all of this not because we are stupid or mindless or weak, but because we are human, and because there is no one on the planet who does not want to feel they belong somewhere, even if that somewhere is the wrong place...And it is gradually becoming clear to me that I am immensely hungry for much more than food. I am hungry for the things all of us are really hungry for: hungry to be seen and known, hungry to be accepted the way I am. There may be no more difficult desire for an African American woman to fulfill" (1992, p. 54).

This excerpt reflects on the ways that black women use food to deal with the unique pressures they face in light of both the SBW framework as well as poverty, and racialized sexism. There also lies in this statement the impossible nature of black women's aspiration to fill the various holes that society has generated for them as the ignored "other", the abnormality in normalized white images of feminine beauty.

Theory and Hypothesis

My research will utilize intersectionality theory in a

deductive approach to understanding how and why predominately white institutions (PWIs) in conjunction with Black culture⁶ (with regards to body image ideals and perceptions of mental health issues) are currently placing barriers to treatment for black female students who suffer from eating disorders. Intersectionality as a theory and research paradigm helps us to understand the ways in which one's location within and among such hierarchical statuses like race, gender, class, sexuality, and age influence intrapersonal and interpersonal experiences (West et. al. 2016). This theory is relevant for my research study because few studies have taken an intersectional analysis of what it means to struggle with an eating disorder as a black woman on a predominately white college campus.

As mentioned, the current individual psychological emphasis placed on the definition of an eating disorder has inadvertently excluded the larger social systems of oppression that dictate black women's lives and subsequently, their relationships with food. For instance, according to the U.S. Department of Education, black women currently hold the highest percentage of Associate's and Bachelor's degrees conferred by race and gender in the United States (National Center for Education Statistics, 2016). Despite this, they only make on average 60 cents in comparison to the 79 cents the average white woman makes and in comparison, to the dollar the average white man makes (U.S. Census Bureau, 2015). This is one example of the various ways that black women are systematically disadvantaged by issues of classism that are reinforced by racialized sexism. The effects of this kind of discrimination on the development of eating disorders and disordered eating are not currently being discussed on a salient level in medical research. And as a result, clinicians, physicians, nutritionist, and therapists who specialize in treating eating disorders may be missing a large piece of the puzzle that prevents them from helping black women at equivalent rates as white women.

However, while the individualistic psychological approach helps prevent creating a one-size-fits-all system for those struggling with eating disorders, it inadvertently builds on middle-to-upper class white women's experiences. For eating disorders, in some ways, sexism acts as a baseline for explaining the unique pressures that women face with body image issues and striving towards thinness as a cultural ideal. Since this baseline does not take into account forms of racialized sexism or classism, black women with eating disorders are facing additional barriers to treatment. The theoretical approach of eating problems, on the other hand, was created to be more inclusive of black women and other women of color's experiences. Analyzing the larger social conditions that influence poor women and/or poor women of color's relationships with food is helpful in tackling different ways that food is used as a coping mechanism for the traumas that marginalized groups of women face, but it doesn't allow room for treatment. While the coping mechanism is asserted as an appropriate response to said traumas, that

framework doesn't address psychotherapeutic methods of healing that are typically involved in eating disorder treatment. Thus, there needs to be a bridging of the individualistic eating disorder framework with that of the more intersectional "eating problems" framework in an effort to create an inclusive space for black women at PWIs to seek treatment for their eating disorders and disordered eating.

Eating disorders and disordered eating act as a lens through which a plethora of social injustices exist and until this fact is at the very least acknowledged by relevant professionals and researchers, black women at PWIs will not get the support that they need to recover from their eating disorders. For my research project, I want to gauge the level of cultural sensitivity to these phenomena and frameworks that can lead professionals (therapists, psychologists, nutritionists, clinicians, and primary care physicians) to reinforce the exclusion of black women from diagnosis and treatment, thus reinforcing society's problematic understandings of what an eating disorder is and who can suffer from an eating disorder.

Methodology

I conducted a qualitative study of semi-structured interviews to examine how effective resources aimed to provide support to those suffering with an eating disorder are in providing inclusive support of black female college students. I examined the extent to which medical professionals are culturally sensitive to the unique experiences of black female college students at a large, public, southern predominately white institution, henceforth called PSU. I interviewed a racially diverse group of professionals (clinicians, researchers, psychologists, and physicians) at three PSU-related centers, which I will call: CAPS, ULHC, and PCED, using a semi-structured interview schedule which included questions concerning services they provide⁸. A semi-structured interview is a qualitative method of interviewing that uses a predetermined set of questions alongside the opportunity for the interviewer to explore responses further (Miles, Gilbert, & Fylan; 2008).

To find professionals in each organization and department, I conducted a snowball sampling. A snowball sampling is a recruitment technique in which research participants are asked to assist researchers in identifying other potential subjects (Goodman, 1961). I found my first respondents by first using directories to identify eating disorder specialists and professionals whose interests lie in working with diverse populations. I interviewed each participant in person with a recording device with hopes of capturing speech patterns as well as a way of analyzing a more wholesome picture of how these professionals (if at all) address their bias (whether it be through their discipline and specialized training, through their race, or both) with regards to disordered eating behaviors and patterns in Black female college students. At the conclusion of each interview, I transcribed the conversation and responses to the questions to better analyze patterns across

responses. When conducting the interviews, I used an inductive methodological approach using Barney Glaser and Anselm Strauss's grounded theory. In *The Discovery of Grounded Theory* (1967), Glaser and Strauss describe grounded theory as a way of constructing theory through the analysis of data.

Results and Data Analysis

I conducted five interviews with professionals who work in CAPS, ULHC, and PCED. The professionals interviewed were nutritionists, psychiatrists, researchers, and clinicians; the interviews lasted from fifteen minutes to an hour. I asked each of the professionals the following eight questions:

1. What work do you specifically do in aiding those who struggle with an eating disorder?
2. What do you think is the biggest myth about eating disorders?
3. Why do you think that so many people go untreated?
4. What about college campuses do you think contributes to these elevated rates of eating disorders?
5. There are still somewhat conflicting studies that question whether or not people of color, predominantly women of color experience eating disorders at the same rate as white women. Do you believe that women of color deal with eating disorders at similar rates? Why or why not?
6. If you do believe that they experience it at similar rates, then would you say that the different women you see in treatment are reflective of that? Why or why not?
7. Are there any additional factors (if any) do you take into account when developing a course of treatment for female college students who may be struggling with an eating disorder?
8. What role do you think insurance policies have on women seeking treatment?

For the purposes of this research paper, I will analyze responses to questions two, five, and six because the responses to these questions provide a great deal of information about what professionals consider to be both salient perceptions about eating disorders as well as why they think the gap exist between those who experience eating disorders and those seen in treatment. I did not analyze the five remaining questions for a few reasons. One reason is because participant responses discussed basic demographic information. Another reason is because participants discussed information regarding the issues with resources on college campuses regarding eating disorder treatment generally and not related to cultural sensitivity specifically. On a similar note, participants discussed the reasons why frequency of eating disorder occurrences are elevated on college campuses in ways that were confirmed above in the literature review. Overall, these five questions were not directly related to

my research question, but rather an interview technique for priming the subject to discuss sensitive topics such as race and mental health.

To preface my analysis of the interviews conducted, however, I also want to highlight a few important conditions that surrounded the interviews conducted. One consideration to understand is that it was difficult to find eating disorder specialists in the various professions described above and none of the professionals I was referred to at CAPS were black women, women of color, or people of color in general. One of the professionals at CAPS that was interviewed, Marisa, served as a member of CAPS' eating disorder team. The other professional at CAPS that was interviewed, Andrew, is an influential staff member of CAPS at PSU. Thus, the amount of power that these individuals hold in the treatment process (or lack thereof) for students with eating disorders is significant.

A second observation to consider is that there are no black female clinicians or researchers at PCED or black clinicians or researchers in general. Thus, the lack of black female students with eating disorders in treatment at PCED—as mentioned by Rebecca (a Latina clinician, researcher, and faculty member of ULHC) in her interview—is parallel to the lack of black female clinicians and researchers at PCED as well.

A final note of importance concerns the fact that the psychological services at this university operates under a brief therapy model—as mentioned in Marisa and Andrew's interviews. This model explains that because this large university has to serve such a large population of undergraduate and graduate students, the relatively small team of psychiatrists and therapists in CAPS do not have the resources to provide the medium-to-long term psychotherapeutic treatment needed to help a person recover from an eating disorder. Instead, students who need medium-to-long term support for treatment tend to be referred out into a network of local therapists. Needless to say, this has the potential of creating more inherent barriers to treatment for students both physically (in terms of distance off campus) and financially.

You Have to Look a Certain Way

The first response pattern I observed was the varying responses to question two among white professionals and professionals of color. Both professionals of color said that one of the biggest myths about eating disorders is that it only affects a specific kind of population. Cait, who is Latina and works at an organization specializing in helping Latinos with eating disorders, specifically said that a big myth is that people "have to look a certain way to have an eating disorder. You have to be thin, or you have to be female." Rebecca agreed that "one of the biggest myths is that it's sort of singled out as this middle-to-upper class white female issue."

Among the white professionals, only one of three said the same thing. Katherine, a nutritionist, anecdotally said that eating disorders are seen as "the rich white girl's disease." The other two white professionals, both psychia-

trists, brought attention to the unknown psychological impacts on eating disorders. Marisa stated that one of the biggest myths about eating disorders is that “it’s all about the food.” Andrew said,

“I think the greatest misunderstanding from people who are not experiencing body image disturbance, is what it’s like to experience a body image disturbance... one of the myths is that, you know, maybe the person is just making it up or something, or needs to like, love themselves more, or something like that, without recognizing that it really is a disruption between what’s happening and how a person is perceiving that.”

While all of the mentioned myths about eating disorders play an important role in preventing people from getting the treatment they need for their eating disorder(s), Cait said it best when claiming that,

“There’s lots of stereotypes about what you’re supposed to look like if you have an eating disorder and I think that’s very damaging because it prevents people from seeking help if they’re struggling with something that doesn’t look like what they see on TV...”

She hints not only at the pervasive role that media plays in the exposure to risk for developing an eating disorder, but also the damaging effect it can have in preventing someone from getting help if they do not fit into society’s misguided idea of who can struggle with an eating disorder. This process can be damaging for black women, a population that is consistently left out of studies that discuss the relationship between eating disorder symptomatology and media consumption. Of the few studies that does discuss the link between eating disorder symptomatology and media consumption, researchers have focused on middle-to-upper class white people (Harrison and Cantor, 1997).

Professional of Color: Where Are We Hanging Those Flyers?

Another pattern I observed in responses to questions two, five, and six was that even though all the professionals confirmed that the vast majority of people they see in treatment are white, some even clarifying that the vast majority of the people they see in treatment are white women, the reasoning behind their statements varied among white professionals and professionals of color. In response to question two, Rebecca, a Latina clinician, researcher, and faculty member of ULHC, claims that there needs to be better and more culturally sensitive diagnostic criteria because,

“[M]ost of the diagnostic criteria are based on the study primarily of that of Caucasian populations. So we don’t know for sure if the instrument that we have... (pause)...can assess the eating disorder accurately on African American, Latina populations, Asians.”

The language used in diagnostic criteria for eating dis-

orders, she asserts, is what can lead to the under-diagnoses and misdiagnoses of women of color with eating disorders. She also states that even when organizations, such as the National Institute for Mental Health (NIMH) for example, do require the recruitment of diverse populations, the ways in which they recruit can be biased towards more acculturated and more privileged groups within communities of color. Using the Latino community as an example, Rebecca claims,

“Usually the tendency is to recruit the population that is easiest for them to recruit...for example, if I am doing a study and I wanted to include Latinos, I know that I have to have the instruments and the consent forms in both languages and if I will go provide treatment, I know that I will have to use some treatments that provide bilingual services. But, if I am saying that I will recruit 20% or 10 % of Latino, but they need to speak English or do everything in English, then (sigh) you are selecting the most acculturated Latino population, which is not the big part of the pie of the Latino population.”

Rebecca makes an excellent point in calling attention to the consequences of standardizing eating disorder criteria in the experiences of white patients; even if diverse populations are recruited, the most vulnerable groups, people with disordered eating who do not have the resources to get treatment, are still excluded from essential medical research and ultimately treatment itself.

Cait also talked about the effects that the recruitment process has in placing barriers to treatment for women of color with eating disorders. She states:

“I think one thing we could do better about, specifically in research, is making sure that we are trying, actively trying to recruit women of color into our treatment studies. So a lot of times when you see different research studies that have been out there, you know, they’ll post flyers in different places, they’ll do like ads on different websites and that kind of thing, in order to get as many people in as possible. But, we need to think strategically about: Where are we hanging those flyers? Where are we posting those different social media advertisements? That sort of thing to make sure we are getting... a representative sample of the population and not just sort of going with our usual mechanisms for recruiting. So I think that’s one thing that the research side can do...I think that one of the things that the treatment side can do is making sure that if their marketing brochures or their websites, that kind of thing, seem to market to a particular community, be sensitive to that and be thinking about, How can I make my place of work as inclusive and welcoming to anybody who might be struggling with some sort of eating pathology?”

She tackles not only the issues of advertising treatments and clinical trials, but also brings up the importance of clinicians not assuming that the research and clinical trials done are representative samples. Both Cait and Rebecca,

who are professionals of color, assert that treatment facilities and eating disorder researchers can do better in terms of putting forth the effort of being inclusive of women of color who struggle with eating disorders aside from pointing out the non-discriminatory pathology of the disorder.

White Professionals: I Don't Know if that Theory Has Been Debunked.

White professionals' responses to question five and six, on the other hand, were more nuanced and perplexed in nature. Both Marisa and Andrew expressed that they were not aware of the literature on the topic, but rather, they only knew of what they experienced in their twenty to thirty-year careers at CAPS. Statements similar to these, in which one's seasoned experience as a psychiatrist as a justification for not knowing current literature—literature on this subject in particular, that really started to emerge in the 1990s (Bordo, 1993; Comas-Díaz and Jacobsen, 1991; Dolan, 1991; Greene, 1994; Heatherton and Baumeister, 1991; Hesse-Biber, 1996; Root 1990; Thompson, 1994; Williamson, 1998)—is concerning because it reinforces two conditions. First, psychiatrists are not actively aware that women of color experience most eating disorders at similar rates as white women. Relatedly, their experience with aiding those with eating disorders comes to revolve around the experiences of the majority of students that they have treated—white women. Thus, a system of excluding black women from effective treatment for eating disorders simply reinforces itself.

Both professionals then go on to voice their lack of knowledge on the subject. Marisa states:

"I'm not sure I'm familiar enough with the research right now, to be able to speak to that. So I want to like, put that caveat out there—I know in the past, this is really taking me back in the past—there was more talk in the past that non-white women, had (pause) different perspectives on what was acceptable in terms of body shape and size, but I don't know if that theory has already been debunked, and if it has, then I'm not, one hundred percent certain."

Not only is the psychiatrist unaware of the research, but the research she is aware of is outdated; thus, it is equally significant as lack of cultural sensitivity is in placing barriers to treatment for black women. Andrew is also perplexed by the question I presented aimed to gauge whether he believes women of color experience eating disorders at similar rates as white women. He vocalizes:

"I mean, I, I would suspect (pause) this is not something that I have heard and so umm, I certainly know from my perspective and everyone that I work with is that we're attending to the possibility of body image disturbance equally in everyone who comes in. Not only of color or white but also male and female and everything in between. Umm (pause) yeah, I mean that's, yeah it's not a place, it's not a place where we're distinguishing between one and the other on that. (pause) But it's in-

teresting. It would be a (pause) yeah, and so the studies think women of color might have more or less?"

Not only does he shy away from directly using the term 'eating disorder', but he also asserts CAP's non-discriminatory attitude towards the impact of body image disturbance. A concerning aspect, however, is his statement—"it's not a place where we're distinguishing between one and the other on that." Andrew's language when describing CAPS' handling of students with body image disturbance, one of many notable factors in the development of an eating disorder, demonstrates a lack of cultural sensitivity for the experiences of those who fit outside of the majority of students that Andrew has worked with—white, female students. Again, this poses a threat to black women who struggle with eating disorders and disordered eating because if they were to actively seek treatment through CAPS, the unique conditions in which they experience their eating disorders would not be recognized, due to the indistinguishable nature of catering to white female college students' experiences instead.

In her *Psychology Today* article, "Colorblind Ideology is a Form of Racism," Dr. Monnica Williams—a clinical psychologist, researcher, and professor at the University of Connecticut with expertise in areas of mental illness, tests and measurement, and ethnic differences—delves into the implications of colorblind ideology in psychotherapeutic relationships. She explains that when therapists don't recognize the role that experiences related to one's racial or ethnic identity play in the development of mental health issues, they aren't seeing "the whole picture, and the client is left frustrated." Furthermore, Williams claims that by "encouraging the exploration of racial and cultural concepts, the therapist can provide a more authentic opportunity to understand and resolve the client's problems" (Comas-Díaz & Jacobsen, 1991).

Additionally, I observed that the examples of eating disorders that Marisa and Andrew used to discuss their frameworks of treatment were mainly composed around the symptomatology of anorexia and bulimia. In Andrew's interview, he never mentioned binge eating disorder or OSFED as an example of the eating disorders that he helps to facilitate treatment for. While this may be out of sheer mistake and forgetfulness, it certainly puts into perspective what he considers to be salient disorders in terms of the most frequently encountered disorders in his experience as a psychiatrist. This observation once again points to a developed bias of dealing with mainly white female college students that can inadvertently be exclusive of black women's experiences. In Marisa's interview, she states:

"More often than not, when a student doesn't recognize that [they have an eating challenge], and we suggest it, they're like 'No, I, I'm good. Oh no, an eating disorder? No, I don't have an eating disorder' (laughter) ...So it's a lot more challenging when we're suggesting

‘Well I think, I’m concerned that you might have incredibly low weight’ because that’s the only thing that we would notice. If someone has bulimia, you’re not gonna notice (pause) that, generally speaking. Unless, on occasion, I have noticed young women who had scabs in certain places on their fingers that would be a clue to me that there’s a possibility of some sort of self-induced vomiting.”

In this response, she highlights some of the physical symptoms and appearances that can be signs for her as a psychologist, that the student may be dealing with some form of disordered eating. In this case as well, the eating disorder symptomatology that she references is that of anorexia and bulimia. Since binge eating is a more common coping mechanism for black women, how much help would a black woman get if she did not have scabs on her arms or if she was not perceived to be underweight? The same attention that is paid attention to extreme thinness, for example, is not the same attention that is directed towards larger bodies, the body types that are not uncommon for young black women to occupy (Mayorga et. al., 2014). This serves as another barrier for black women seeking treatment because their disordered eating patterns may not fit the standard of those more frequently and most easily recognized by relevant professionals.

Proportion vs. Raw Numbers

Lastly, a pattern that I observed is that four out of five of the professionals, if they stated that they saw more white (and for some, white women) people in treatment than any other group or population, then immediately attempted to remedy their statements in mentioning that those numbers may make sense because the university is a PWI. While bringing up the proportionality of those struggling with eating disorders to the demographics of the student population at the university is a valid statement, there seemed to be a misunderstanding of the question. Whether it was intentional or not, many of the professionals conflated the use of the term ‘rates’ in questions five and six with the general raw numbers and demographics detailing those suffering with eating disorders on the university’s campus. This false amalgamation of the two concepts not only muddles the purpose and intent of their original statement, but it also creates a scenario in which ignoring the needs of the minority is justified so long as the majority’s needs are satisfied. Essentially, not adjusting advertisements for treatment, language used in diagnostic criteria, and treatment plans to suit the specific needs of black female college students becomes justified because the current tools and means of treatment suit the needs of the majority of students seen in eating disorder treatment—white women. The problem with this reasoning is that it reinforces problematic and exclusive paradigms of treatment for eating disorders. If adjustments are never made to include women of color—especially black women—into treatment out of convenience, then assumptions

will not only continue to be that white women are the main population affected by eating disorders, but that all people experience eating disorders in the same way.

Additionally, most professionals, when asked question six, pointed to the fact that they do not just work with white female students in treatment—they also work with Asian and Latino students. This lumping of people of color together in the context of PWIs also has ramifications. Assuming that people of color only exist in relation to whiteness and white supremacy acts as a form of erasure for the subtler ways in which cultures interact between and amongst each other. In this specific context, black women, despite the increasing amount attending college, are excluded from the diverse populations in which treatment for eating disorders are facilitated (National Center for Education Statistics [NCES], 2007).

Discussion and Implications

The observations discussed above about the interviews conducted with relevant professionals points to real problems facing eating disorder research and treatment, and these problems directly and indirectly have consequences for black women with eating disorders on predominately white college campuses. First, my results indicate that psychiatrists are not always or necessarily aware of relevant studies in the past twenty years relating to eating disorders in communities of color. This lack of accountability with regards to relevant professionals not being required to stay updated on studies in their field only serves to reinforce the exclusive paradigms of eating disorder treatment. This is because psychiatrists who specialize in eating disorders are not being made aware of the ways in which it is important to be culturally sensitive to their patients, assuming those patients feel comfortable enough to get help in the first place.

Another barrier facing eating disorder treatment is lack of diversity amongst relevant professionals. There are no black female professionals at CAPS who specialize in eating disorders and there are no black female clinicians or researchers at PCED. This very much mimics what is seen on other campuses (Clauss-Ehlers and Parham, 2014). Rebecca, explains that putting all of people of color into one category of research and labeling it as “diverse” doesn’t give researchers the “power to see if [they] have differences across the groups.” Her organization, PCED, serves as a model that should be considered for the other organization CAPS. The need for more black female professionals with a specialization in eating disorders, a disease that is non-discriminatory in its pathology, is a significant step needed to help create effective conversations surrounding aiding black women through treatment.

Furthermore, a general lack of education about the varying ways in which different populations experience eating disorders and disordered eating, seems to be motivated in part by the university’s brief therapy model. Because the university’s large undergraduate population does not allow CAPS to provide long-term psychotherapy treatment to undergraduate students with eating disorders, there

seems to be, in turn, a lack of motivation or perceived lack of necessity for psychiatrists to have a specialization not only in eating disorders, but in eating disorders for various subgroups within communities of color. However, having specialist training is a very important step in helping to further de-stigmatize eating disorder treatment. Moreover, it is important to make sure that all psychiatrists and psychologists at university-supported psychological services organizations are given specialist training, not just those who are members of the eating disorder teams. This process is necessary to ensure that there is a diverse group of psychiatrists and psychologists at CAPS who are equipped to do their best to help any student who comes in with issues of disordered eating.

Overall, current frameworks of eating disorder research and treatment are embedded in racist colorblind ideology. Acknowledging that anyone can suffer from an eating disorder without adjusting diagnostic criteria and other assessment tools needed to develop a treatment plan ensures that people who do not fit into the exclusive paradigm of treatment designed for white women will continue to be excluded and discriminated against.

Conclusion

In this paper, I had two goals. First, I wanted to analyze several research studies in order to gain a better understanding of the internal community that influences black women's disordered eating relationships, as well as their perceptions (or lack thereof) their eating patterns as disordered eating. The second goal was to assess the extent to which relevant professionals at a large public southern university were aware of these disparate experiences. This

small qualitative study allowed me to better understand the ways in which CAPS and other relevant resources at PWIs operate in ways that can be barriers to treatment for black women with eating disorders and disordered eating. Through my analysis of the interviews I conducted, I found that there is a clear implementation of discriminatory and exclusive treatment practices through colorblind ideology that is mainly expressed through relevant white professionals—the vast majority of those employed at PWIs. The surge of black women in colleges and universities across the country necessitates having not only inclusive eating disorder research and diagnostic criteria, but also of inclusive recruitment and treatment practices in the interest of creating a safe and inclusive environment of wellbeing for all students, not just those who are born with the privilege of being white.

Works Cited

1. Beauboeuf-Lafontant, Tamara. "Living the Lies." *Behind the Mask of the Strong Black Woman: Voice and the Embodiment of a Costly Performance*. Philadelphia: Temple UP, 2009. 49-57. Print.
2. Bordo, Susan. (1993). *Unbearable Weight: Feminism, Western Culture, and the Body*. Berkeley: University of California Press.
3. Bowles, Doug. "A Radical Idea: Men and Women Are Different." *Cardiovascular Research* 61.1 (2004): 5-6. Web.
4. Bray, Rosemary. 1992. Heavy burden. *Essence* 22 (January): 52-54, 90-91
5. Brownell, Kelly D., Kathy J. Holte, Michael R. Lowe, and Gina E. Rayfield. "Eating Disorders." *American Psychological Association*. N.p., Oct. 2011. Web. 11 June 2016.
6. Comas-Forgas, Lillian, and Frederick M. Jacobsen. "Ethnocultural Transference and Countertransference in the Therapeutic Dyad." *American Journal of Orthopsychiatry* 61.3 (1991): 392-402. Web.

Footnotes

1. See the following article for more information on the bias of algorithms used in search engines that reflect the larger social context of what people see on the internet versus the reality of what should be shown. <https://www.theguardian.com/technology/2016/apr/08/does-google-unprofessional-hair-results-prove-algorithms-racist>
2. Purging can refer to not only self-induced vomiting, but also over-exercising and the overuse of diet pills and laxatives
3. Anorexia nervosa affects 0.5% of the United States' population and bulimia affects 1-3% of the United States' population (Iarovici, 2014).
4. "The freshman 15" is defined by dictionary.com, is a common slang used in the United States and Canada to note the average 15 pounds that first year students in college can expect to gain
5. Disordered eating in this context refers to behaviors and symptoms that may align strongly with eating disorders, but not enough to actually meet diagnostic criteria for any specific disorder.
6. Black culture in this context refers to prevalent cultural norms and practices in black American communities, seeing as though little research has been done on the specific conditions in which black immigrants experience disordered eating during their unique process of acculturation. This statement is of course, operating under the understanding that Black culture is not homogenous and should not be assumed to be so.
7. It is important to note here as well, that in this context, I am not referring to the growing amount of black immigrants in the U.S. black population, but specifically the African-American community. To see more about the shifts in population dynamics and national origin of members within the U.S. black community, see the following article: <http://www.pewsocialtrends.org/2015/04/09/a-rising-share-of-the-u-s-black-population-is-foreign-born/>
8. The names of the centers and resources mentioned, with the exception of CAPS, have been changed to preserve anonymity about the university in which the qualitative data was collected.

7. Cynthia Bulik on Eating Disorders. Perf. Cynthia Bulik. YouTube. UNC-Chapel Hill, 9 Feb. 2010. Web. 20 June 2016.
8. Chamorro, Rebeca, and Yvette Flores-Ortiz. "Acculturation and Disordered Eating Patterns Among Mexican American Women." *Latina Health in the United States: A Public Health Reader*. By Marilyn Aguirre-Molina and Carlos W. Molina. San Francisco, CA: Jossey-Bass, 2003. 585-90. Print.
9. Clark, K. B. (1972). Foreword. In A. Thomas & S. Sillen (Eds.), *Racism and psychiatry* (pp.11-13). New York: Brunner/Mazel.
10. Clauss-Ehlers, Caroline S., and William D. Parham. "Landscape of Diversity in Higher Education: Linking Demographic Shifts to Contemporary University and College Counseling Center Practices." *Journal of Multicultural Counseling and Development* 42.2 (2014): 69-76. Web. 26 July 2016.
11. Dolan, Bridget. (1991). Cross-Cultural Aspects of Anorexia and Bulimia: A Review view. *International Journal of Eating Disorders*. (10)1.
12. Donovan, R. A. (2011). Tough or tender: (Dis) Similarities in white college students' perceptions of Black and White Women. *Psychology of Women Quarterly*, 35, 458- 468. doi: 10.1177/0361684311406874
13. Donovan, R. A., & Williams, M. (2002). Living at the intersection: The effects of racism and sexism on Black rape survivors. *Women and Therapy*, 25, 95-105. doi:10.1300/j015v25n03_07
14. "Eating Disorders Affect Us All | Research Results on Eating Disorders in Minority Populations." National Eating Disorders Association. N.p., n.d. Web. 11 June 2016.
15. Epstein, Steven. *Inclusion: The Politics of Difference in Medical Research*. Chicago: U of Chicago, 2007. Print.
16. Glaser, Barney G., and Anselm L. Strauss. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine Pub., 1967. Print.
17. Goodman, L. A. (1961). Snowball sampling. *The annals of mathematical statistics*, 148-170.
18. Gordon, Kathryn H., Yessenia Castro, Lilya Sitnikov, and Jill M. Holm-Denoma. "Cultural Body Shape Ideals and Eating Disorder Symptoms among White, Latina, and Black College Women." *Cultural Diversity and Ethnic Minority Psychology* 16.2 (2010): 135-43. Web.
19. Greene, Beverly. (1994). African American Women. In L. Comas-Diaz and B. Greene (Eds.), *Women of Color: Integrating Ethnic and Gender Identities in Psychotherapy*. New York: The Guilford Press, pp. 10-30.
20. Guess, T. J. (2006). *The Social Construction of Whiteness: Racism by Intent, Racism by*
21. *Consequence*. *Critical Sociology*, 32(4), 649-673. doi:10.1163/156916306779155199
22. Harris-Perry, M. (2011). *Sister Citizen: Shame, stereotypes, and Black Women in America*. New Haven, CT: Yale University Press.
23. Harrison, Kristen, and Joanne Cantor. "The Relationship between Media Consumption and Eating Disorders." *Journal of Communication* 47.1 (1997): 40-67. Web. 23 July 2016.
24. Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as an escape from self-awareness. *Psychological Bulletin*, 110, 86-108.
25. Hesse-Biber, Sharlene. (1996). *Am I Thin Enough Yet? The Cull of Thinness and the Commercialization of Identity*. New York: Oxford University Press.
26. "Highlights of Changes From DSM-IV to DSM-5." *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition (n.d.): n. pag. American Psychiatric Association. American Psychiatric Association, 2013. Web. 19 June 2016.
27. Iarovici, Doris. "Disordered Eating." *Mental Health Issues and the University Student*. N.p.: Johns Hopkins UP, 2014. 98-114. Print.
28. Joseph, Ammu. "The Media and Women's Mental Health." *Mental Health from a Gender*
29. *Perspective*. Ed. Bhargavi V. Davar. Thousand Oaks, CA: Sage Publications, 2001.
30. 370-89. Print.
31. Levine, Michael, Pam Carlton, Sharon Davie, and Shelly Steinwurtzel. "Collegiate Survey Project." National Eating Disorders Association. N.p., 2013. Web. 19 June 2016.
32. Marin, G. (1992). Issues in the measurement of acculturation among Hispanics. In K. F. Gessinger (Ed.), *Psychological testing of Hispanics* (pp. 235-251). Washington, D.C.: American Psychological Association.
33. Mayorga, Maria E., Odette S. Reifsnider, Zinan Yi, and Kelly J. Hunt. "Trends in BMI and Obesity in U.S. Women of Childbearing Age during the Period of 1980-2010." *Health Systems* 4.3 (2014): 176-86. Web. 26 July 2016.
34. Miles, J., Gilbert, P., & Fylan, F. (2008). *A handbook of research methods for clinical and health*
35. *psychology*. Oxford: Oxford University Press.
36. Molloy, Beth L., and Sharon D. Herzberger. "Body Image and Self-Esteem: A Comparison of African-American and Caucasian Women." *Sex Roles* 38.7/8 (1998): 631-43. Web. 27 June 2016.
37. National Center for Education Statistics. (2007). *Digest of education statistics*. Retrieved from http://nces.ed.gov/programs/digest/2007menu_tables.asp
38. Neighbors, Harold W., and James S. Jackson. *Mental Health in Black America*. Thousand Oaks: Sage Publications, 1996. Print.
39. Opie, Tina R., and Katherine W. Phillips. "Hair Penalties: The Negative Influence of Afrocentric
40. Hair on Ratings of Black Women's Dominance and Professionalism." *Frontiers in Psychology Front. Psychol.* 6 (2015): n. pag. Web. 19 July 2016.
41. Orbach, Susie. [1978] 1988. *Fat is a feminist issue: The anti-diet guide to permanent weight*
42. *loss*. New York: Berkeley Books.
43. "Other Specified Feeding or Eating Disorder." Other Specified Feeding or Eating Disorder | National Eating Disorders Association. N.p., 2016. Web. 20 June 2016.
44. Parekh, Ranna. "What Are Eating Disorders?" *What Are Eating Disorders?* N.p., May 2015. Web. 20 June 2016.
45. Reslan, Summar, and Karen K. Saules. "College Students' Definitions of an Eating "binge" Differ as a Function of Gender and Binge Eating Disorder Status." *Eating Behaviors* 12.3 (2011): 225-27. Web.
46. "Research Results on Eating Disorders in Minority Populations." National Eating Disorders Association. N.p., n.d. Web. 15 June 2016.
47. Romero, R. E. (2000). The icon of the strong Black Woman: The paradox of strength. In L. C. Jackson, & B. Greene (Eds.), *Psychotherapy with African American women* (pp. 225-238). New York: The Guilford Press.
48. Root, Maria P. P. "Disordered Eating in Women of Color." *Sex Roles* 22.7-8 (1990): 525-36. Web.
49. Smart, J. F., & Smart, D. W. (1995). *Acculturative Stress: The Experience of the Hispanic*
50. *Immigrant*. *The Counseling Psychologist*, 23(1), 25-42. doi:10.1177/0011000095231003
51. Stephenson, Terence. "How Children's Responses to Drugs Differ from Adults." *British Journal of Clinical Pharmacology Br J Clin Pharmacol* 59.6 (2005): 670-73. Web. 28 June 2016.
52. Thompson, Becky W. *A Hunger so Wide and so Deep: American Women Speak out on Eating Problems*. Minneapolis: U of Minnesota, 1994. Print.
53. United States of America. National Center for Education Statistics. *National Center for Education Statistics-Degrees Conferred by Sex and Race*. U.S. Dept of Education, May 2012. Web. 27 June 2016.
54. U.S. Census Bureau. (2015). *Current Population Survey (CPS), Annual Social and Economic (ASEC) Supplement: Table PINC-05: Work Experience in 2014 - People 15 Years Old and Over by Total Money Earnings in 2014, Age, Race, Hispanic Origin, and Sex*. Retrieved 25 June 2016, from <http://www>.

census.gov/hhes/www/cpstables/032015/per inc/pinc05_000.htm (Unpublished calculation based on the median earnings of all men and women who worked full time, year round in 2014)

55. Walker, Speshal T. "Black Beauty, White Standards: Impacts on Black Women and Resources

56. for Resistance and Resilience." Order No. 3622213 University of Massachusetts Boston, 2014. Ann Arbor: ProQuest. Web. 12 June 2016.

57. West, Lindsey M., Roxanne A. Donovan, and Amanda R. Daniel. "The Price of Strength: Black College Women's Perspectives on the Strong Black Woman Stereotype." *Women & Therapy* 39.3-4 (2016): 390-412. Web.

58. Wilfley, Denise E., W. Stewart Agras, and C. Barr Taylor. "Reducing the Burden of Eating Disorders: A Model for Population-based Prevention and Treatment for University and College Campuses." *Int. J. Eat. Disord. International Journal of Eating Disorders* 46.5 (2013): 529-32. Web.

59. Williams, Monnica T., Dr. "Colorblind Ideology Is a Form of Racism." *Psychology Today*. N.p., 27 Dec. 2011. Web. 19 July 2016.

60. Williamson, Lisa. "Eating Disorders and the Cultural Forces Behind the Drive for Thinness." *Social Work in Health Care* 28.1 (1998): 61-73. Web.



Alexis Roane is a junior in the Department of Women's and Gender Studies and the Department of Public Policy with a specialization in both disciplines at the University of North Carolina at Chapel Hill. She is interested in public health policy, specifically, intersectional policy affecting women and communities of color. While interning in London this past spring, she worked for Solace Women's Aid. This internship allowed her to work directly with women impacted by domestic and sexual violence and inspired her interest in research in the intersectionality of women, stratification, and violence. She specifically holds an interest in public policy concerning women of color and expanding traditional meanings of violence to domestic and sexual violence, to include police brutality, mass incarceration, and legacies of slavery and colonialism. To better understand how women of color experience these various forms of violence, Alexis hopes to use a reproductive justice framework to envision policies that promote equity and wellbeing in these communities. As a certified trainer for UNC's Campus Y organization "Embody Carolina," Alexis leads sessions on allyship for students struggling with eating disorders. She plans to pursue a PhD in Public Policy with a focus on Social Policy.

Health Sciences

38 - 41

Drug Delivery Particle Simulations to Predict Optimal Maxillary Sinus Deposition in a Post-Surgical Chronic Rhinosinusitis Patient

by Snigdha Das, Julia Kimbell, Ph.D

Faculty Advisor: Dr. Laura Miller, Associate Professor of Biology and Mathematics, UNC Program in Bioinformatics and Computational Biology

Center for Interdisciplinary and Applied Mathematics

In her research project, Drug Delivery Particle Simulations to Predict Optimal Maxillary Sinus Deposition in Post-Surgical Chronic Rhinosinusitis Patients, Snigdha studied nasal spray deposition in a patient who had undergone Functional Endoscopic Sinus Surgery (FESS), the most common surgery used to treat CRS. Her study had two specific aims, one being to study spray deposition patterns for recommended head tilts, breathing techniques, and nozzle positions ("current use conditions") using computational fluid dynamics (CFD) and the other to find optimal combinations of these factors that would result in the greatest particle deposition (drug delivery) to the maxillary sinus. She and her lab developed a 3D-printed model of the nasal passages of this patient for comparison of maxillary sinus deposition under current and optimal use conditions using gamma scintigraphy. Her study is part of a larger effort to improve use of nasal sprays for treatment of CRS.

42 - 49

Sleep, Perceived Stress, and Salivary Cortisol Response in Undergraduate Students

by Jessie Van Gaasbeck, Jyotsna Panthee, Caroline Owens, Ritu Malla, Sofia Edelman, Joseph DelFerro

Faculty Advisor: Dr. Mark Sorensen, Associate Professor, UNC Department of Anthropology

Joseph DelFerro, Sofia Edelman, Ritu Malla, Caroline Owens, Jyotsna Panthee, and Jessie Van Gaasbeck created a study to determine the relationship between perceived stress, salivary levels, and sleep patterns in undergraduate students. Using a variety of sampling techniques to find a sample population, the group used two stress metrics, cortisol screening measures and interviews to determine the relationship between students' perceived stress, their sex (male or female), and actual levels of stress.

50 - 53

Examining the Involvement of Limbic Brain Circuits in Modulating Sensitivity to Alcohol Drug States

by Verda Agan

Faculty Advisor: Dr. Joyce Besheer, Associate Professor

Bowles Center for Alcohol Studies and UNC Department of Psychiatry

After working as an undergraduate research assistant in Dr. Besheer's neuropharmacology lab, Verda completed an independent research project regarding the functional role of the insular-striatal circuit in modulating the interoceptive effects of alcohol. In her study she used a chemogenetic approach (Designer Receptors Exclusively Activated by Designer Drugs; DREADDS) to determine the role of the insular cortex (IC) in the interoceptive effects of alcohol (1 g/kg, IG). In this training procedure, the alcohol drug state (i.e., the feeling of drunkenness) sets precedent for the onset of a cue light followed by a sucrose reward. The discrimination training method took advantage of an innate behavior to seek food (i.e., goal-tracking). The results from this work reveal that a Pavlovian discrimination method can be used to evaluate the interoceptive effects of alcohol (Besheer).

54 - 59

Respiratory Sinus Arrhythmia Predicts Future Infant Sleep Quality and Emotional Reactivity to Stress

by Archita Chandra

Faculty Advisor: Dr. Hellen Maths, Film Studies

For her senior honors thesis under Dr. Cathi Propper, Archita examined whether infant physiological self-regulation in baseline and stress-inducing scenarios could predict future sleep quality and emotional reactivity to stress. Her study was carried out by looking at 119 African American infant-mother dyads. Home visits were conducted at 3 and 6 months of age where the same process was repeated at each visit including baseline health measures such as heart rate, monitoring sleep for one week after the visit based on respiratory sinus arrhythmia rate, and the still face paradigm was conducted at only the 6th month visit. The research is ongoing and she hopes for all statistical analysis to be done soon so final conclusions on each hypothesis can be drawn.

Drug Delivery Particle Simulations to Predict Optimal Maxillary Sinus Deposition in a Post-Surgical Chronic Rhinosinusitis Patient

by Snigdha Das, Julia Kimbell, Ph.D

Topical drug therapies can be effective in treating chronic rhinosinusitis (CRS) in both surgical and non-surgical patients. However, sometimes sufficient amounts of a drug cannot reach the affected area; one of the most affected areas is the maxillary sinus. Costs associated with CRS are estimated at over \$8 billion annually; we hope our study will help increase the efficiency of drugs and reduce the number of FESS procedures, thereby reducing this cost. We are studying nasal spray deposition in a patient who had Functional Endoscopic Sinus Surgery (FESS), the most common surgery used to treat CRS. This study has two specific aims: 1) to study spray deposition patterns for recommended head tilts, breathing techniques, and nozzle positions ("current use conditions") using computational fluid dynamics (CFD) and 2) to find optimal combinations of these factors that will result in the greatest particle deposition (drug delivery) to the maxillary sinus. We also developed a 3D-printed model of the nasal passages of this patient for comparison of maxillary sinus deposition under current and optimal use conditions using gamma scintigraphy. Simulations of nasal airflow and spray particle transport were run using Fluent™ (ANSYS, Canonsburg, PA), a CFD program. Gravity was numerically manipulated in the simulations to represent six head positions. Twenty nozzle positions characterized possible directions of output from the nasal spray. Currently steady state inspiratory airflow is being studied, but breathing conditions under no airflow are in progress. CT scans of the FESS patient were transferred into Mimics™ (Materialise, Plymouth, MI) and ICEM™ (ANSYS, Inc.) to design a 3D model for printing. Gamma scintigraphy will eventually be used to measure maxillary sinus deposition of radio-labelled nasal spray under current and optimal use conditions to test the hypothesis that CFD-derived optimal use conditions significantly improve maxillary sinus deposition. Preliminary simulation results with steady-state inspiratory airflow suggest that in this post-operative patient, maxillary sinus deposition may be improved if the patient uses a nasal spray while tilting their head to the left. This study is part of a larger effort to improve use of nasal sprays for treatment of CRS. These results are currently preliminary, using one FESS patient, but will be expanded to additional patients and simulation scenarios in the future.

Keywords: chronic rhinosinusitis, FESS, computational fluid dynamics

Introduction

Costs associated with CRS are estimated at over \$8 billion annually. Thus we are conducting this study in hopes of helping increase the efficiency of drugs and reducing the number of FESS procedures, thereby reducing this cost. Chronic rhinosinusitis can be

treated with surgery, medicine, or both. However, often the drugs prescribed to CRS patients are meant for sinus and inflammation symptoms and the target sinus may not be receiving the proper dosage, or even a significant amount of the drug. This is shown in various studies, where particles of the drug flow through the nasal airway and do

not deposit in the targeted area. This study aims to find optimal conditions for patients to use nasal sprays to increase chances of deposition in affected areas, so that symptoms of CRS can be adequately treated.

Hypothesis

We hypothesize that spray deposition (drug delivery) to the maxillary sinus can be improved by optimizing recommended head tilts, breathing techniques, and nozzle positions ("current use conditions").

Additionally, the use of the drug will be studied in both pre- and post-operative cases to improve affects both before and after surgery.

Methods

First, the CT scan of a post-FESS patient was imported into Mimics™ software where a 3D reconstruction of the nasal passages is made. The reconstruction was then imported into model to be used in future gamma scintigraphy experiments. A computational mesh was created consisting of approximately 4 million tetrahedral-prism hybrid cells. This mesh was used to run ICEM-CFD™ where CAD (Computer Aided Design) tools were used to design a 3D-printed simulations where gravity was implemented in different directions to simulate different head positions.

Computer simulations were conducted in Fluent™. Steady-state inspiratory airflow was simulated at a resting breathing rate of 15 L/min. Twenty release points representing various spray nozzle positions were simulated. Sprays were represented by 24,995, 50,003, or 74,995 particle streams. Within each spray, 58 particle sizes were included to show the distribution of possible particles that could compose a single nasal spray.

Step 3

This mesh was used to run simulations where gravity was implemented in different directions to simulate different head positions.

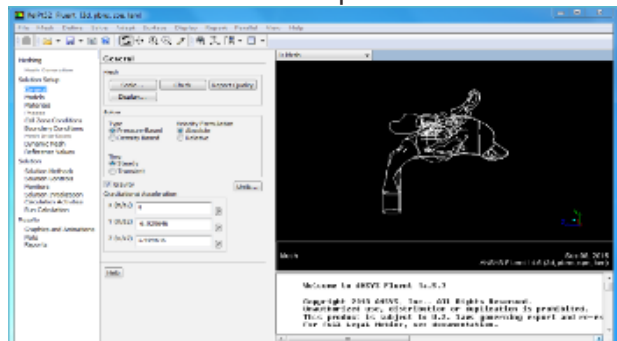


Figure 3: ANSYS Fluent™ (Particle Simulations)

Step 1

CT scan of a post-FESS patient is imported into Mimics™ software where a 3D reconstruction of the nasal passages is made.

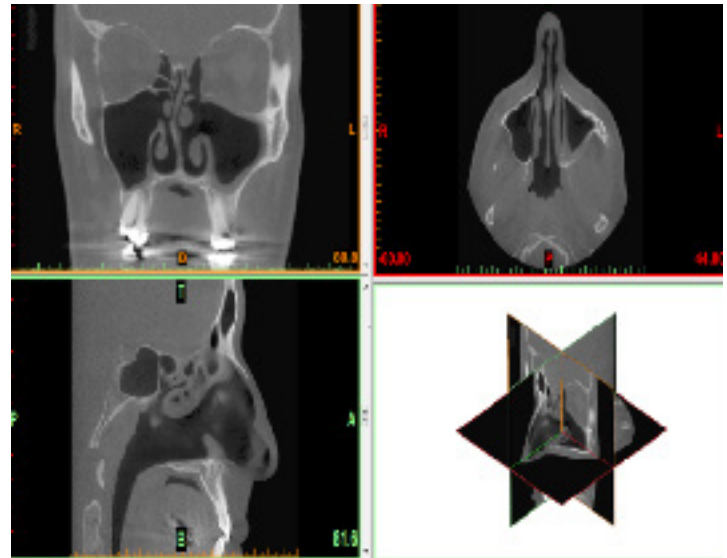


Figure 1: FiMimics™ (CT of Pre-FESS Patient)

Step 2

The reconstruction is then imported into ICEM-CFD™ where CAD (Computer Aided Design) tools were used to design a 3D-printed model to be used in future gamma scintigraphy experiments. A computational mesh was created consisting of approximately 4 million tetrahedral-prism hybrid cells.

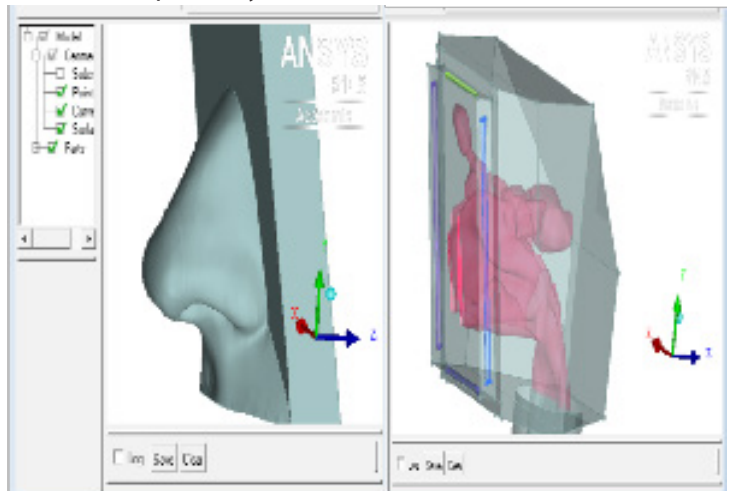


Figure 2: ICEM™ (CAD Model of Nasal Airways and Sinuses)

Results

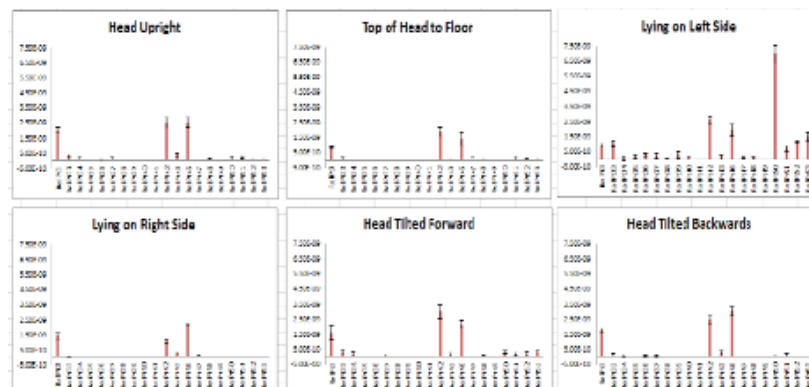


Figure 1. This set of graphs shows the mass of particles that deposited in the targeted left maxillary sinus from simulations of sprays represented by 50,003 particle streams. The twenty release points are represented along the x-axis and the mass of particles is represented by the y-axis. Error bars represent sample standard deviations for 5 runs of each spray, characterizing variability from Fluent™'s random population of each spray cone area by spray streams.

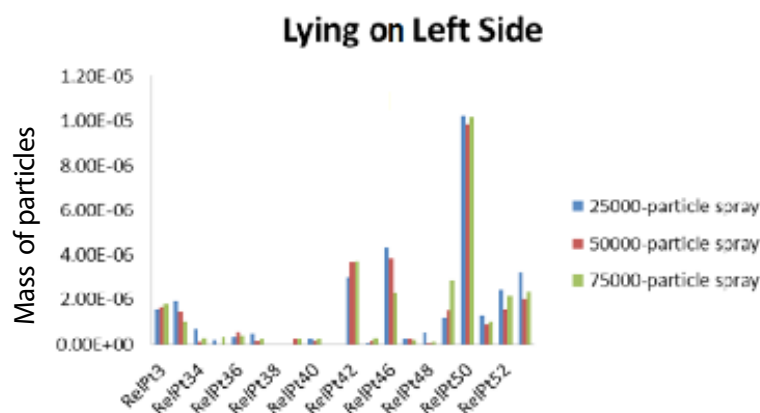


Figure 2. A single run with each of the three spray representations.

- Release points 42 and 46 have stream directions that overall have the most deposition throughout all the head tilt positions (*Fig. 1*).
- Sprays from release point 50 while lying on the left side show greater deposition than other scenarios (*Fig. 1*).
- Deposition predictions from the 20 release points are not very sensitive to the number of streams in the sprays (*Fig. 2*).

Discussion

- Because CRS impacts so many Americans each year (approximately 11 million a year), it is important to maximize benefits from these medications while reducing the need for systemic drugs and additional surgery.
- The results show that based on the data gathered, lying on the left side results in the greatest particle deposition.
- As the current study progresses the preliminary data of the patient shown here has allowed for further methods to be developed in an automated fashion for further trials to be done.

Future Directions

- The particle simulations will be expanded to include drug delivery simulations of sprays with zero airflow and accelerating flow.
- The particle simulations will provide a basis on which to further study specific scenarios which show the best results of particle deposition.
- Through further study and expansion of the current methods developed, we hope to better understand pos-

sible optimal conditions for use of nasal sprays in practical applications.

Summary

- Research on improving chronic rhinosinusitis treatments, specifically optimizing nasal spray deposition so drug can effectively reach the maxillary sinus.
- Study uses computational fluid dynamics (CFD) to optimize factors that can better deliver nasal spray to targeted area, such as adjusting head tilts, breathing techniques, and nozzle positions.
- Optimized factors are tested using a 3D printed model of the patient's nasal passages and gamma-scintigraphy.
- The experiment was done using the CT scan of 1 patient and a 3D computerized model of the patient's nasal passages was reconstructed. Computer simulations were used to show how nasal spray particles will act in the gravity field in different positions.
- Innovative research because it uses new technology to create a computerized model for studying nasal sprays,

can be used to study other specific scenarios.

Acknowledgements

- Drs. Brent Senior, Adam Zanation, Charles Ebert, Kibwei McKinney, Stan McClurg, Dennis Frank-Ito, Matthew Wofford, and Ms. Nina Pande
- The University of North Carolina at Chapel Hill
- Chancellor's Science Scholars
- Research reported here was supported by the National Heart, Lung, and Blood Institute of the National Centers of Health under award number R01HL122154. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health under award number R01HL122154. The content is solely the responsibility of the author's and does not necessarily represent the official views of the National Institutes of Health.

Works Cited

1. Smith, K. A., Orlandi, R. R. and Rudmik, L. (2015), Cost of adult chronic rhinosinusitis: A systematic review. *The Laryngoscope*, 125: 1547–1556. doi: 10.1002/lary.25180
2. Suh, Jeffrey D. and David W. Kennedy, Treatment Options for Chronic Rhinosinusitis, *Proceedings of the American Thoracic Society* 2011 8:1, 132-140
3. Wofford, M.R., Kimbell, J.S., Frank, D.O., Dhanda, V., McKinney, K.A., Fleishman, G.M., Ebert, C.S., Jr., Zanation, A.M., and Senior, B.A. (2015). A computational study of functional endoscopic sinus surgery and maxillary sinus drug delivery. *Rhinology* 53(1):41-48.
4. Frank, D.O., Zanation, A.M., Dhanda, V.H., McKinney, K.A., Fleischman, G.M., Ebert, C.S., Senior, B.A., and Kimbell, J.S. (2013). Quantification of airflow into the maxillary sinuses before and after functional endoscopic sinus surgery. *Int. Forum Allergy Rhinol.* 3(10):834-840.
5. Kimbell, J.S., Segal, R.A., Asgharian, B., Wong, B.A., Schroeter, J.D., Southall, J.P., Dickens, C.J., Brace, G., and Miller, F.J. (2007). Characterization of deposition from current nasal spray devices using a computational fluid dynamics model of the human nasal passages. *J. Aerosol Med.*, 20(1):59-74.



Snigdha Das is a senior graduating with Honors from the College of Arts and Science with a Bachelor of Science in Biology and minors in Neuroscience and Asian Studies. She is a Chancellor's Science Scholar and currently works in the Kimbell Lab in the UNC School of Medicine, Department of Otolaryngology / Head and Neck Surgery. Outside of the lab, Snigdha is a part of the Buckley Public Service Scholars, Carolina Cystic Fibrosis Club, and MEDLIFE. In her free time, she enjoys the the arts. She hopes to one day become a physician.

Sleep, Perceived Stress, and Salivary Cortisol Response in Undergraduate Students

by Jessie Van Gaasbeck, Jyotsna Panthee, Caroline Owens, Ritu Malla, Sofia Edelman and Joseph DelFerro

Previous literature suggests an association between diurnal cortisol levels and perceived stress in conjunction with both sleep quality and quantity in a variety of populations. The goal of the present study was to examine the association between cortisol levels, perceived stress, and sleep in a sample of undergraduate students. Forty-eight participants provided morning and evening salivary cortisol samples and completed the Cohen Perceived Stress Scale (PSS). A subsample ($n=32$) completed the Pittsburgh Sleep Quality Index (PSQI). Six participants were selected for ethnographic interviews focused on stress and coping. Females in our study had higher concentrations of both diurnal and nocturnal cortisol, as well as slightly higher perceived stress levels (Cohen, Kamarck, & Mermelstein, 1983). We found an inverse association between sleep quality, as measured by the PSQI, and perceived stress. The study demonstrates the positive correlation between heightened perceived stress and poor sleep. Additionally, females should be aware of their possible predisposition to high cortisol concentrations in response to stress as well as heightened perceptions of stress. The results of our study can contribute to the limited amount of data on stress in undergraduate students. Based on our results, students should be more aware of their stress levels and their associated health consequences. Further studies in undergraduate students should be conducted with a larger sample size over an elongated study period to better analyze these relationships.

Keywords: Sleep, Perceived Stress, and Salivary Cortisol Response in Undergraduate Students

Introduction

University students are often reported as highly stressed, a notion not only supported by media reports but also by scientific research. For many young adults, the transition to a university setting increases daily pressures and demands, ranging from academia to social acclimatization. The long-term accumulation of these daily stressors has been correlated with negative psychological and physiological effects, including stroke, heart attacks, and problem drinking (McEwen, 2008). Moreover, these effects have been linked to alterations in the activity of the hypothalamic-pituitary-adrenal axis (Pruessner, Hellhammer, Pruessner, & Lupien, 2003).

Cortisol, a hormone of the hypothalamic-pituitary-adrenal axis, functions as an adaptive response to extrinsic

and intrinsic stressors (Pruessner et al., 2003). In humans, cortisol follows a circadian rhythm, peaking approximately thirty minutes after waking, then declining gradually through the day until reaching the lowest point within the first half of the night (Fries, Dettenborn, & Kirschbaum, 2009). Levels of cortisol increase in response to stress, and chronic elevations produce a number of damaging effects on the body (Backhaus, Junghanns, & Hohagen, 2004; Sapolsky, 2004). Chronic stress is associated a number of negative health outcomes including autoimmune disease, cardiovascular disease, the metabolic syndrome, and upper respiratory infections (Cohen et al., 2012). Past research has analyzed the impact of stress and worry on cortisol levels, as well as correlations with feelings of loneliness and depression (Doane et al., 2009).

Prior research has also examined the associations

between perceived stress and mental health in college students, finding that high levels of perceived stress is associated with poor mental health, lower physical activity, and lower academic achievement when compared to peers with less perceived stress (Leppink, Odlaug, Lusk, Christenson, & Grant, 2016). Other work has found that not all students feel or express stress in the same manner, with gender, personality and temperament contributing to variation in stress response and coping. Research conducted by Broughman and colleagues (2009) suggests that females report higher levels of overall stress, greater stress for familial relationships, social relationships and daily hassles, and greater overall use of self-help to cope with stress.

Perceived and biological stress play a critical role in sleep habits and sleep wellness in the college population. Recent studies work to determine the impact of sleep quality, quantity, and variability on college students. These studies frequently examine the consequences of inadequate sleep, the use of medication and alcohol as sleep aids, and falling asleep behind the wheel, among others (Taylor, & Bramoweth, 2010). Prior work has also demonstrated that sleep and stress have opposing effects on cortisol awakening response (Van Reeth et al., 2000). Born and colleagues found that cortisol awakening response is affected by sleep quality and quantity such that earlier waking is associated with higher awakening response (1989).

This research aims to combine analyses of cortisol, a stress biomarker, with those of perceived stress and in the college population. We also investigate correlations between perceived stress, cortisol, and self-reported sleep patterns. This study also aims to contribute a better understanding of how cortisol levels in college students differ from the general population.

Methods and Procedures

Participants

Forty-eight UNC undergraduate students were sampled. Students were recruited on a volunteer basis, with the requirement that they were completing their undergraduate degree as full-time students and had no history of health problems that would alter cortisol cycles (e.g., Cushing's disease, amyloidosis, or alcohol consumption; no participants were excluded based on these criteria). Of the forty-eight students in our study, thirty-five were female and thirteen were male. The larger representation of female participants is partially attributable to the gender ratio at UNC where fifty-eight percent of undergraduates are female (U.S. News, 2015). Data were collected during the Summer 2015 and Fall 2015 semesters. From the fall sample, additional data on major, course load, extracurricular activities, and self-assessment of sleep was collected. Information from the fall cohort reveals academic diversity, with majors ranging from business to women's and gender studies. However the majority of participants were working toward attaining a degree in the sciences (N=18), with fewer pursuing degrees in the humanities (N=13).

Measures

Salivary Cortisol

Cortisol concentration was measured using a commercially available ELISA assay Salimetrics LLC, Carlsbad, CA [Kit No. : 1-300n-2] (Salimetrics, 2014)

Cohen Perceived Stress Scale

Each participant completed the ten-item Cohen PSS as a measure of their self-reported stress. Each item is rated on a 5-point scale. Positively worded items are reverse scored and the ratings are summed, with higher scores indicating more stress. A score of 13 is considered average, with scores of 20 or higher indicating high stress (Cohen, Kamarck, & Mermelstein, 1983).

Pittsburgh Sleep Quality Index (PSQI)

PSQI, created by Buysse and colleagues, is a 19-item questionnaire with seven component scores: subjective sleep quality, sleep latency (i.e., how long it takes to fall asleep), sleep duration, habitual sleep efficiency (i.e., the percentage of time in bed one is asleep), sleep disturbances, use of sleeping medication, and daytime dysfunction. These scores are combined into global score, with lower scores indicating better sleep quality (1989).

Case Study Ethnographies

To gain further insight into individual experiences of stress, six participants were interviewed using an ethnographic semi-structured interview. Ethnographic questions also emphasized sleep wellness in correlation with perceived stress. Interview questions included several different topics of inquiry: perceptions on school and workload, extracurricular activities, sleep schedules, and coping mechanisms for stress (Bernard, 1988). Participants were also asked to recall a particular time they were stressed and to discuss how they perceived that stress and if/how they coped with their stressor, as well as occasions in which they felt sleep impacted their stress, whether positively or negatively.

IRB

This project was approved by the University of North Carolina at Chapel Hill IRB, study number #16-0232.

Procedures

Participants provided two salivary cortisol samples: one immediately after waking and one immediately before going to sleep on the same day. Participants recorded the sample collection time, food consumed that day, and whether or not they had consumed alcohol within 24 hours of sample collection. Samples were frozen after collection and transported to the Human Biology Laboratory at UNC for analysis of cortisol. Participants in the summer cohort then completed the Cohen Perceived Stress Scale, while participants in the fall cohort were asked to complete an online questionnaire that included the Cohen PSS, the Pittsburgh Sleep Quality Index, and questions about participation in extracurricular activities. Ethno-

graphic interviews were conducted on a subsample of participants on the relationship between sleep, stress and coping. Unfortunately due to time constraints and the nature of our original project, we decided to interview only six of the original participants. Each group member selected one of their participants in a non-random sample for the voluntary interview which lasted between 30 minutes to an hour. These participants were asked questions about their lifestyles as well as questions about their perceptions of stress and sleep in an effort to better understand the causes of stress and coping strategies among our sample.

Results

As shown in Figure 1, males had lower morning and evening cortisol than females and a smaller morning-evening difference (0.321 vs 0.265 $\mu\text{g/dL}$). The larger difference for females was primarily due to higher morning cortisol levels. Mean values for the PSS, PSQI and cortisol

are shown in Table 1. Males had lower mean PSS scores than females (16.4 vs. 18.3), and had lower PSQI scores (5.2 vs. 7.0). PSS scores ranged from 7 to 32, and PSQI global scores ranged from 2 to 14. Individual morning-evening slopes are shown in Figure 2. Most individuals were found to have higher cortisol levels in the morning and lower levels in the evening, creating a negative slope. Some individuals in our study did not exhibit this pattern, but instead had the opposite pattern or experienced very little variation between the two sample collections.

This study examined sex differences in the association between PSS score and morning salivary cortisol concentration, shown in Figure 3. We did not find a statistically significant association between PSS and morning cortisol. The Pearson correlations were 0.38 ($p=0.28$) for males and -0.20 ($p=0.26$) for females.

To determine the association between perceived stress and sleep quality we examined the Pearson correlation be-

Table 1. Mean Cohen PSS score, PSQI score, and salivary cortisol concentrations stratified by gender

	N	Cohen PSS	PSQI	Morning Cortisol ($\mu\text{g/dL}$), mean	Morning Cortisol ($\mu\text{g/dL}$), standard deviation	Evening Cortisol ($\mu\text{g/dL}$), mean	Evening Cortisol ($\mu\text{g/dL}$), standard deviation
Female	36	18.3 (4.7)	7	0.566	0.223	0.245	0.112
Male	12	16.4 (7.4)	5.2	0.456	0.186	0.191	0.145
Cronbach's Alpha		0.86	0.78				

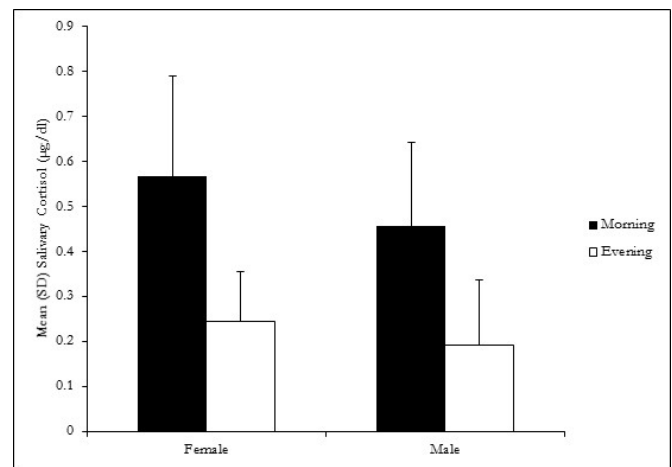


Figure 1. Morning and evening salivary cortisol concentrations, stratified by gender. Salivary cortisol concentrations were analyzed using an ELISA test. Females in the study had higher average salivary cortisol concentrations in both the morning and evening than the males.

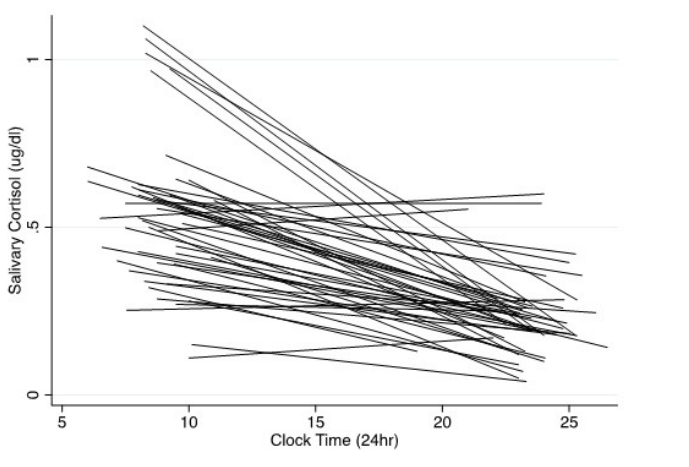


Figure 2. Linear regressions for each participant, demonstrating the slope created from analyzing the difference in morning and evening salivary cortisol concentrations. Cortisol concentrations were calculated using an ELISA test, and times over a twenty-four-hour period were aggregated from participant self-reports.

tween PSS and the PSQI, shown in Figure 4. The Pearson correlation was 0.46 ($p = .014$) indicating a moderately strong association between poor sleep and higher perceived stress.

Discussion

How are cortisol and perceived stress related in our study?

The cortisol concentrations of males in our study had a stronger correlation with PSS scores than the cortisol concentrations of females, indicating a sex difference in perceptions of stress for our subjects. The correlation between PSS score and cortisol concentration was positive and non-significant for males, suggesting the higher perceived stress level associated with a higher cortisol concentration would likely be statistically significant in a larger sample. In contrast, a weak negative association was exhibited in females, suggesting that a higher perceived stress level is not necessarily associated with a higher cortisol concentration in this group. A previous study on undergraduate students, conducted by Murphy and colleagues (2010), found that there was no significant correlation between perceived and biomarker measures of stress. Moreover, studies have suggested that there are sex-linked differences in cortisol secretion depending on the type of stressor individuals experience at the time of study. One such study examined sex-differences between individuals exposed to an achievement stressor and a social stressor and found that males had significantly greater cortisol elevations in response to an achievement stressor, measured by a mathematical or verbal problem-solving question (Stroud, Salovey, & Epel, 2002). Conversely, women had significantly greater cortisol elevations in response to a social stressor, involving two instances of social rejection.

Both biomarker and self-reported measures of stress, including those employed in this study, are linked to health-related consequences. Perceived stress alone can influence immune function and lead to poor sleep, hygiene, and changes in diet (Murphy et al., 2010). Though each may indicate negative health implications, perceived stress and salivary cortisol levels are not necessarily linked (Fink, Bonde, Vammen, Mikkelsen, & Thomsen,

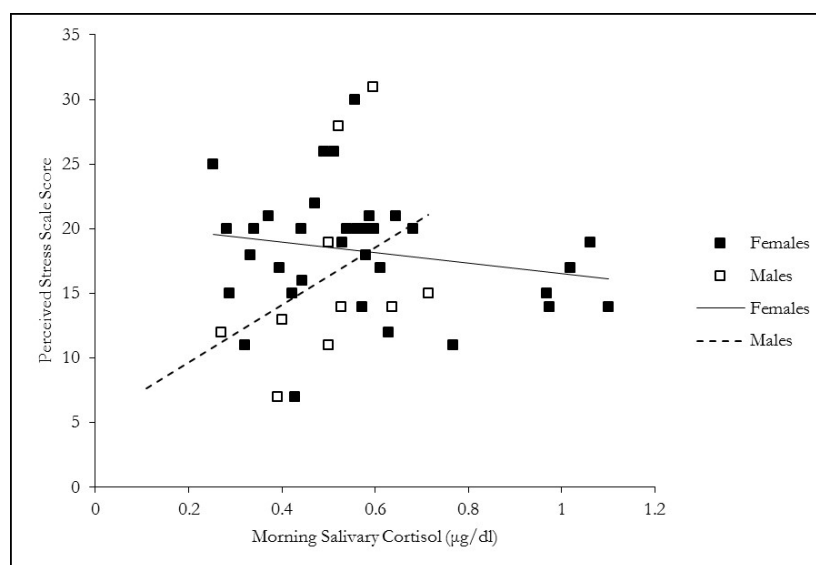


Figure 3. Relationship between perceived stress score and morning salivary cortisol concentration, stratified by sex. Perceived stress scores were measured using the Cohen PSS and morning salivary cortisol samples were analyzed using an ELISA test. Stratification did not demonstrate a statistically significant association between PSS and morning cortisol for either sex.

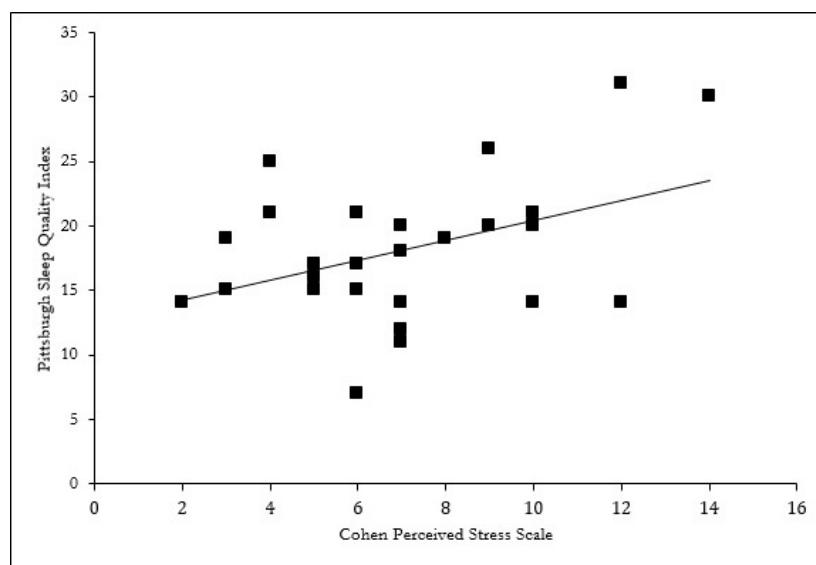


Figure 4. Relationship between perceived stress and Pittsburgh sleep quality index score for individuals in the fall cohort. Scores for each index were collected in a comprehensive online questionnaire through UNC qualtrics. The regression demonstrates a moderately strong association between poor sleep and higher perceived stress.

2014), highlighting the need for combined physiological and perceived measures to capture different aspects of the stress experience.

The results of our study can contribute to the limited amount of data on stress, both biochemical and perceived, for undergraduate students. Based on our results, students should be more aware of their stress levels in order to maintain proper coping mechanisms and avoid the negative health consequences of high stress-responses. Additionally, females

should be aware of their possible predisposition to high cortisol levels, and students should recognize that a perception of high stress can be a valid indicator of possible underlying biological responses to stress.

How are sleep and stress interrelated in our study?

Weak associations were exhibited between stress and sleep. No correlation was found between PSQI scores and morning cortisol levels. This contradicts research that has shown correlations between poor sleep and higher levels

of CAR, or cortisol awakening response. A positive correlation was found between PSQI scores and PSS scores such that individuals who reported poor sleep reported higher stress. Findings presented by Lee and colleagues on female undergraduates corroborate the association between sleep disturbances and greater levels of perceived stress (2013). These findings suggest that individuals should be aware of the interplay between sleep quantity and quality and stress. Previous studies conducted on sleep in college

Table 3. Participant Experiences

Stress as a college student	Coping mechanisms	Sleep
College students are just expected to do everything and that just a realistic goal (Interview 1).	Well like exercise. Cardio, yoga, um sometimes I like meditate. I try to stay away from sugar. Just like overall healthy lifestyle kinds of things. Its more of a thing that if I don't take care of myself I will get stressed (Interview 1).	Yes, because I am tired and then umm [pause] I am more exhausted and I need to relax but I can because I have to do something so like its frustrating (Interview 2).
Yes? [pause] I don't know. Well, I feel like college is just a stress. And I don't know if it's my specific major that is stressful cause I don't know compared to some other majors it's as stressful but like, it's still kinda stressful (Interview 2).	Sleep, watch YouTube videos, hang out with friends, umm... (Interview 2).	If I'm sleepy, if I don't get enough sleep before class, I am less likely to pay attention and, umm, understand like the concepts. For work, I guess I become a little less patient and frustrated easier (Interview 2).
Because there is a lot of pressure to do well in college so that you can get a job. There's also like a stigma that college students go to college and spend all this money and then never, some of them never, get a job so then you just wasted all this money and you're already in debt and you have no way to take care of yourself. So that's kinda stressful thinking that could happen to me. Umm, yeah (Interview 2).	I think exercise is the easiest thing that you can do to get like some instant relief (Interview 1).	Yes. Lot of moods when I'm sleep deprived (Interview 4).
Well, as a college student you're balancing being an adult because you are responsible for taking care of yourself. You're also responsible for getting your work done in time, so anything correlating with school work as a student. Your course load if it's heavier than others [pause] depending on the classes you're taking and I also think being able to have time management skills. If you don't have time management skills you're more likely to be more stressed as a student because there is so much going on in your life [pause] usually (Interview 4).	I think I tend to feel better after I dance, like the whole endorphins and exercise thing definitely holds true for me. I will feel a lot better on weeks when I exercise (Interview 3).	Whenever I oversleep [mhm] like that, that puts me off schedule or throws me off in the morning and goes through my whole day. Like if I don't go through my usual morning routine I am like not on my game for the rest of the day basically (Interview 3).
Probably in terms of classwork there is a lot of work and the structure of a lot of classes isn't all super helpful and like there is this whole concept of weed-out classes where they add a lot of hard material. It isn't helpful to actually learn that material and causes too much stress (Interview 1).	Netflix, pet my cat, take a walk, sleep (Interview 4).	

populations illustrate the negative social consequences of poor sleep, including lower grades and higher rates of depressive disorders (Hersher, & Chervin, 2014).

Ethnographic interviews

In our study demonstrated individual perceptions of sleep in relationship to levels of stress. Those who stated they were stressed about course work or general stressors not only cited sleep as a way to mitigate their stress, but also as a contributing factor of their stress. The results collected provide insights about the stressors faced by college students, affected by sleep patterns, and how they impact students' mental, physical, and social health.

How do our subjects describe their experiences with stress and or sleep, based on ethnographic interviews?

As seen in Figure 1, cortisol undergoes a relative decline throughout the day. Individual slopes that are flat or increase indicate a dysregulation in the circadian cycle of cortisol, which may indicate psychological conditions or disrupted sleep (Stetler, & Miller, 2005). The average fluctuation between morning and evening cortisol concentration for females was slightly higher than males, with a 0.321 $\mu\text{g/dL}$ differential for females as compared with a 0.265 $\mu\text{g/dL}$ change for males. This sex difference also aligns with expected patterns as noted in previous studies and the Salimetrics assay kit. Most individuals in our study exhibited normal fluctuation given the two sample points; however, future studies should be conducted over a longitudinal period to examine day-to-day variation in this pattern.

Consistent with prior research, women in our study had higher morning and evening cortisol, as shown in Figure 2. Salimetrics provides standard reference levels of diurnal cortisol for adolescents (ages 12-18) within range of 0.021-0.883 $\mu\text{g/dL}$, adult females (ages 21-30) between 0.272-1.348 $\mu\text{g/dL}$, and adult males (ages 21-30) between 0.112-1.551 $\mu\text{g/dL}$. For females in our study, average diurnal cortisol was 0.566 $\mu\text{g/dL}$, falling in the expected value ranges; average diurnal cortisol for males also fell within expected range at 0.456 $\mu\text{g/dL}$. Though few studies have been conducted with undergraduate populations, the data found in our study does align with the concentrations expected based on age and gender. These findings do contrast with our hypotheses in which we predicted that undergraduate students would produce higher levels of cortisol. Higher levels of stress could be mediated simply by considering that all of the participants for our study were young, between 18 and 25, and reported no chronic illnesses.

Participants scored an average of just under 18 on the Cohen Perceived Stress Scale. Using the typical global scoring, this score falls within the categorization of "moderate stress." Unlike cortisol measures, perceived stress did not have significant gender differences, with males scoring an average of 16.4 and females scoring an average of 18.3. These findings differ from prior research indicating women are more likely to report higher stress than men

("Gender and stress", 2010). It is crucial to note, however, that their report release notes that women were also more likely to report that their stress levels had increased over the past five years than men were. Contextualizing this finding with our study, it is possible that females between ages 18-25 perceive lower levels of stress than females from the general population who may be more exposed to patterns of relationship and financial stressors — both of which are cited as causes of elevated stress for women in the APA's findings.

Conclusions

This study contributes to the literature on stress in college students. Our results support the need for students to be aware of their stress levels and apply proper coping mechanisms to avoid the negative health consequences of high stress. Additionally, females should be aware of their possible predisposition to high cortisol levels, and students should recognize that a perception of high stress can be a valid indicator of possible underlying biological responses to stress.

Our study has several limitations. Covariates that may have affected cortisol levels include diet, extracurricular activities, oral contraceptive use, and exercise. For future studies, detailed information on dietary patterns, exercise routines, and extracurricular activities may prove useful. Other sources of error may be derived from a small sample size and disproportionate gender representation, with 80% of the subjects being females whose cortisol concentrations are typically higher and more variable. Further studies in undergraduate students should include additional measures of cortisol variation such as cortisol awakening response with a larger sample size to better analyze these relationships. Moreover, future studies should integrate more demographic data, and include ethnographic interviews to better understand perceptions of stress, as well as coping and to provide a more holistic perspective to the study.

Acknowledgements

We would like to thank the Department of Anthropology at the University of North Carolina at Chapel Hill as well as the Human Biology Laboratory. We would like to especially thank Dr. Mark Sorensen for his unending advising and focus.

Works Cited

1. Backhaus, J., Junghanns, K., & Hohagen, F. (2004). Sleep disturbances are correlated with decreased morning awakening salivary cortisol. *Psychoneuroendocrinology*, 29(9), 1184–1191.
2. Bernard, H. R. (1988). *Research methods in cultural anthropology*. Choice Reviews Online, 26(04).
3. Born, J., Spath-Schwalbe, E., Schwachenhofer, H., Kern, W., & Fehm, H. L. (1989). Influences of corticotropin-releasing hormone, adrenocorticotropin, and cortisol on sleep in normal man. *The Journal of Clinical Endocrinology & Metabolism*, 68(5), 904–911.
4. Brougham, R. R., Zail, C. M., Mendoza, C. M., & Miller, J. R. (2009). Stress, sex differences, and coping strategies among

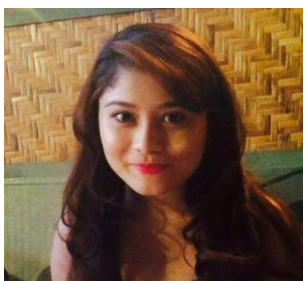
- college students. *Current Psychology*, 28(2), 85–97.
5. Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193–213.
 6. Cohen, S., Janicki-Deverts, D., Doyle, W. J., Miller, G. E., Frank, E., Rabin, B. S., & Turner, R. B. (2012). Chronic stress, glucocorticoid receptor resistance, inflammation, and disease risk. *Proceedings of the National Academy of Sciences of the United States of America*, 109, 5995–5999.
 7. Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396.
 8. Cohen, S., & Williamson, G., (1988). Perceived stress in a probability sample of the United States. Spacapan, S., and Oskamp, S., (Eds.) *The Social Psychology of Health* 31–67.
 9. Cortisol ELISA Kit (Saliva) - Salimetrics assays, 1-3002. (n.d.). Retrieved October, 2016, from <https://www.salimetrics.com/assay-kit/cortisol-salivary-elisa-eia-kit>
 10. Doane, L. D., Adam, E. K., Zinbarg, R. E., Mineka, S., Craske, M. G., & Griffith, J. W. (2009). Prospective prediction of major depressive disorder from cortisol awakening responses in adolescence. *Psychoneuroendocrinology*, 35(6), 921–931.
 11. Fink, S., Bonde, J. P., Vammen, M. A., Mikkelsen, S., & Thomsen, J. F. (2014). Is perceived stress related to an increase in salivary cortisol. *Occupational & Environmental Medicine*, 71(1).
 12. Fries, E., Dettenborn, L., & Kirschbaum, C. (2009). The cortisol awakening response (CAR): Facts and future directions. *International Journal of Psychophysiology*, 72(1), 67–73.
 13. Gender and stress. (2010). American Psychological Association. Retrieved October, 2016, from
 14. <http://www.apa.org/news/press/releases/stress/2010/gender-stress.aspx>
 15. Hershner, S. D., & Chervin, R. D. (2014). Causes and consequences of sleepiness among college
 16. students. *Journal of Nature and Science of Sleep*, 6, 73–84.
 17. Lee, S.-Y., Wuertz, C., Rogers, R., & Chen, Y.-P. (2013). Stress and sleep disturbances in
 18. female college students. *American journal of health behavior*, 37(6), 851–858.
 19. Leppink, E. W., Odlaug, B. L., Lusk, K., Christenson, G., & Grant, J. E. (2016). The young and the stressed: Stress, impulse control, and health in college students. *The Journal of Nervous and Mental Disease*, 204, 805–858.
 20. McEwen, B. S. (2008). Central effects of stress hormones in health and disease: Understanding
 21. the protective and damaging effects of stress and stress mediators. *European Journal of*
 22. *Pharmacology*, 583(2-3), 174–185.
 23. Murphy, L., Denis, R., Ward, C. P., & Tartar, J. L. (2010). Academic stress differentially
 24. influences perceived stress, salivary cortisol, and immunoglobulin-A in undergraduate
 25. students. *The International Journal on the Biology of Stress*, 13(4), 366–371.
 26. Pruessner, M., Hellhammer, D., Pruessner, J., & Lupien, S. (2003). Self-reported depressive symptoms and stress levels in healthy young men: associations with the cortisol response to awakening. *Psychosomatic Medicine*, 65(1), 92–99.
 27. Sapolsky, R. M. (2004). *Why zebras don't get ulcers* (3rd ed.). New York: St. Martin's Griffin.
 28. Stetler, C., & Miller, G. E. (2005). Blunted cortisol response to awakening in mild to moderate depression: Regulatory influences of sleep patterns and social contacts. *Journal of Abnormal Psychology*, 114(4), 697–705.
 29. Stroud, L. R., Salovey, P., & Epel, E. S. (2002). Sex differences in stress responses: social
 30. rejection versus achievement stress. *Biological Psychiatry*, 52(4), 318–327.
 31. Taylor, D. J., & Bramoweth, A. D. (2010). Patterns and consequences of inadequate sleep in college students: substance use and motor vehicle accidents. *Journal of Adolescent Health*, 46(6), 610–612.
 32. U.S. News. (2015). How does UNC rank among america's best colleges? Retrieved October, 2016, from <http://colleges.usnews.rankingsandreviews.com/best-colleges/unc-2974>
 33. Van Reeth, O., Weibel, L., Spiegel, K., Leproult, R., Dugovic, C., & Maccari, S. (2000). PHYSIOLOGY OF SLEEP (REVIEW)—Interactions between stress and sleep: from basic research to clinical situations. *Sleep Medicine Reviews*, 4(2), 201–219.



Sofia Edelman is a Psychology major with minors in Biology and Medical Anthropology. Sofia is graduating in May 2018 and is planning on earning a PhD in clinical psychology. Her current research interests include neurotypicality in children.



Joseph DeFerro is a Biology major with minors in Chemistry and Medical Anthropology. Joseph will be graduating in May 2018 and is planning on earning an MD and working in pediatric healthcare. His current research interests include cytoskeleton interactions and the impact of stress on the health and wellness of college students.



Ritu Malla is an Anthropology major with minors in Medical Anthropology and Chemistry. Ritu graduated in May 2016 and is currently working as a Clinical Trials Assistant with Antibacterial Resistance Leadership Group of Duke Clinical Research Institute. Her current research interests include infectious disease and epidemiology.



Caroline Owens is an Anthropology major with minors in Biology and English. Caroline is graduating in May 2018 and plans to pursue a graduate degree in Biological Anthropology. Her current research interests include evolutionary and biocultural approaches to growth and development, infection and disease ecology, and impacts of psychosocial stress on human health.



Jyotsna Panthee is a Psychology major with a minor in Medical Anthropology. Jyotsna graduated in May 2016 and is currently working as a Research Assistant for Mother Infant Research Studies at UNC Chapel Hill Department of Psychiatry. Her current research interests include mental illnesses among children.



Jessie Van Gaasbeck is an Anthropology major and is graduating in August 2017. Jessie plans to pursue a Clinical Lab Science bachelor degree in fall of 2018. Her current research interests include pathology and diagnostic testing.

Examining the Involvement of Limbic Brain Circuits in Modulating Sensitivity to Alcohol Drug States

by Verda Agan

In 2013, 16.6 million adults, ages 18 and older, had an Alcohol Use Disorder (AUD). Nearly 88,000 people die from alcohol-related causes annually, making it the third leading preventable cause of death in the United States (“Alcohol Facts and Statistics”). New drug treatments could help prevent abuse and potential death from alcohol use. In this study we used a chemogenetic approach (Designer Receptors Exclusively Activated by Designer Drugs; DREADDS) to determine the role of the insular cortex (IC) in the interoceptive effects of alcohol (1 g/kg, IG). In this training procedure, the alcohol drug state (i.e., the feeling of drunkenness) sets precedent for the onset of a cue light followed by a sucrose reward. The discrimination training method took advantage of an innate behavior to seek food (i.e., goal-tracking). The results from this work reveal that a Pavlovian discrimination method can be used to evaluate the interoceptive effects of alcohol (Besheer). In addition, inactivation of the IC by CNO, which activates the Gi-DREADD vector, led to greater sensitivity to alcohol.

Keywords: alcohol sensitivity, insular cortex, discrimination testing/training, interoceptive effects, first elevation score

Introduction

Interoceptive effects caused by drugs of abuse produce detectable cues (e.g., the feeling of “drunkenness” or lightheadedness that accompanies alcohol drinking) that can drive drug-taking behaviors. However, very little investigation has gone into examining the neural circuitry that modulates the interoceptive effects (i.e., discriminative stimulus effects) of alcohol or other drugs of abuse. One of the regions of interest in investigating the discriminative stimulus effects of alcohol is the insular cortex (IC) for its role in combining internal and external stimuli in interoceptive states to drive motivated behavior. Clinical-imaging studies have shown increased IC activity in response to the interoceptive effects of various drugs of abuse (e.g., cigarettes, cocaine, heroin), including alcohol. In fact, there is proof that cigarette smokers who have suffered damage to the insular cortex smoked less and felt less of the urge to smoke (Paulus, Craig).

We sought to determine whether or not the IC plays

a role in modulating the interoceptive effects of alcohol. Using a Pavlovian drug discrimination method, the onset of a cue light in alcohol sessions signaled the delivery of reward (e.g., sucrose solution) in the liquid receptacle; whereas on water sessions, no reward was delivered following the offset of the cue light. Thus, the alcohol drug state came to control reward-seeking behavior as measured by head pokes into the liquid receptacle. We used a chemogenetic approach to inactivate the IC and data collected revealed more head pokes with IC inactivation. Therefore, our evidence suggests that inactivation of the IC increases sensitivity to the feeling of “drunkenness” (i.e., the discriminative effects of alcohol).

Methods and Materials

Animals

This experiment used 12 male Long Evans rats (Harlan Sprague Dawley, Indianapolis, IN) single- and double-housed in Plexiglas cages. Rats were handled and weighed daily for two weeks ahead of training. Rats were kept on

a fluctuating feed schedule in order to maintain a weight range between 300 and 320 g. Water was always available ad libitum in the home cages. The colony room was maintained on a 12-hour light/dark cycle; experiments were conducted only during the light cycle. Rats were under continuous care and looked after by veterinary staff from the Division of Laboratory Animal Medicine (DLAM) at Chapel Hill; their physical well-being was monitored daily during training and for the course of the experiment.

Apparatus

Chambers (Med Associates) measuring 31 x 24 x 32 cm were located within sound attenuating cubicles. Chambers had an exhaust fan in order to provide ventilation and ensure reduction of external sounds. On one side of the chamber there was a cue light located next to a liquid receptacle equipped with a photobeam detector. The photobeam detector was used to provide data on head entries into the receptacle. On ethanol days only, a liquid dipper presented a 26% sucrose (weight/volume) solution in a 0.1 mL dipper cup for 4 sec. On water days, a liquid dipper did not present a 26% sucrose (w/v) solution and only head entries were monitored.

Pavlovian Drug Discrimination Training and Testing Procedures

Sucrose Access Training

All twelve rats underwent sucrose access training with three 50-min sessions over the course of three days providing 26% (w/v) randomly across the session. The liquid dipper presented sucrose at random upon presentation of the cue light. The probability of sucrose presentation decreased from the first to the last session.

AAV vector infusions

Rats were simultaneously microinjected with a Cre-dependent viral vector, expressing the Gi-coupled hM4Di DREADD (AAV8-hSyn-DIO-hM4D(Gi)-mCherry; 1.0×10^{13} gc/ml) and Cre recombinase (AAV8-Cre-GFP; 7×10^{12} vg/ml) bilaterally into the insular cortex (IC) of male Long-Evans rats (see Figure 1 for injection site). Infusion was delivered at a rate of 0.2 μ l/min for a total infusion time of 10 min. Coordinates of injection in the IC are: ML +4.0, AP +3.2 DV -6.0 (from skull). Following recovery (1 week), rats were trained to discriminate alcohol (0 vs. 1g/kg, IG) in order to allow enough time for the expression of the DREADDS (>7 weeks). For discrimination test sessions, rats received Clozapine N-oxide (0, 1 mg/kg, IP), or CNO, 45-min prior to receiving alcohol (0, 0.3, 1.0 g/kg, IG). At the end of the 45-min delay, the discrimination test session began.

Discrimination Training

Following sucrose access training, discrimination training sessions began and were conducted 5 days per week (M-F). Prior to the start of every session, alcohol (1 g/kg) or water was administered through an intragastric gavage (IG). Immediately following the alcohol or water IG, rats were placed in the chambers. During the first 10-min, no cue lights or sucrose were presented; head entries into the receptacle were also not recorded. After the 10 min delay,

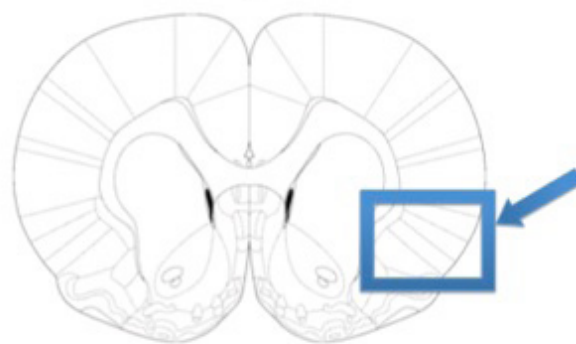


Figure 1: Insular Cortex (IC). The area that is outlined marks the insula located in the rat brain. The experimental group was injected with the Gi DREADDS bilaterally into the insular cortex

the 15 min session began. During session, the cue light was randomly illuminated for 15-sec. The cue light was presented 10 times for both ethanol and water sessions. On ethanol days only, the illumination of the cue light was followed by presentation of 0.1 mL of 26% sucrose (w/v) into the liquid receptacle. On water days, no sucrose was delivered into the liquid receptacle following presentation of the cue light. The duration of the first light presentation varied from 90-150 sec, and the ones that followed ranged from 90-120 sec. Water and ethanol session days were conducted on a double-alteration schedule (W, W, A, A ...). These sessions were conducted until criteria were met for testing: the mean of the discrimination scores from the preceding two alcohol sessions had to be greater than the mean of the discrimination scores from the preceding two water sessions by a score greater than or equal to 1.5 for both the first and average discrimination score. If on testing day criteria was not met for a rat, he did not undergo testing. Only rats that met criteria were tested.

Discrimination Testing

Test sessions were identical in procedure to that of training sessions except they were only 2 min in duration following the 10 min delay. Only 1 light was presented during tests, while the cue light was presented 8 times for acquisition training sessions. The light was presented for 60-105 sec followed by sucrose delivery.

Confirming discriminative stimulus control by alcohol

Once accuracy criteria were met prior to testing, a cumulative alcohol dose curve (0.1, 0.3, 1.0, 1.7 g/kg) was generated to verify that behavior was under the control of the discriminative stimulus effects of alcohol. Rats initially received 0.1-g/kg alcohol (IG) prior to a discrimination test session. Immediately following the end of the test session, rats received a subsequent alcohol dose of 0.2 g/kg (IG) producing a cumulative dose of 0.3-g/kg alcohol, followed by another test session. This procedure was repeated until all cumulative doses were tested.

Dependent Measures and Data Analysis

Head entries were analyzed in 15-sec time intervals for the entire test session. The discrimination score was calculated by subtracting the number of head entries in the 15 sec time interval prior to the presentation of the cue light from the head entries in the 15 sec following presentation of the light cue (i.e., head entries prior to cue – head entries after cue was presented). The first discrimination score (i.e. prior to feedback from sucrose delivery) and the average discrimination score (which includes feedback from when sucrose is absent or present) were used as dependent variables. Data was also collected for head entry rate (head entries/min) and locomotor activity.

Results

Using a one-way repeated measures ANOVA, we determined that there was a significant effect of alcohol between treatments [$F(3,33) = 4.45$, $p = 0.01$]. The Tukey Test revealed this effect was significant for the first elevation score when 1.0-g/kg alcohol was compared to 0.1 g/kg at a p-value of 0.007 (See Figure 2A). However, the first elevation score at a 1.7-g/kg alcohol dose is lower than that of the 1.0-g/kg alcohol dose. Since subjects are not used to an alcohol dose above the 1.0-g/kg baseline, these results suggest that their sensitivity to alcohol becomes almost confounded. Therefore, they have fewer head pokes into the liquid receptacle. Although their sensitivity to alcohol may be reduced, their locomotor activity at this alcohol dose was still around the same as the other alcohol doses (See Figure 2B). This supports evidence that there is no significant interaction between locomotor activity and alcohol dose. Regardless of the alcohol dose quantity, the rats' locomotor activity isn't affected to a significant degree.

Using a two-way repeated measures ANOVA test, there was a statistically significant interaction found between CNO and alcohol [$F(2,11) = 7.38$, $p = 0.009$]. When a 0 or 0.1-g/kg alcohol dose is coupled with 1-mg/kg CNO, the first elevation score is nearly three times the first elevation score than that of the vehicle. There is significant increase in the first elevation score within a 0-g/kg-alcohol dose compared to CNO. There is also statistical significance for the first elevation score within a 0.1-g/kg-alcohol dose at a p-value of 0.002 compared to CNO. However, there is no statistical significance for the first elevation score within a 1.0-g/kg alcohol

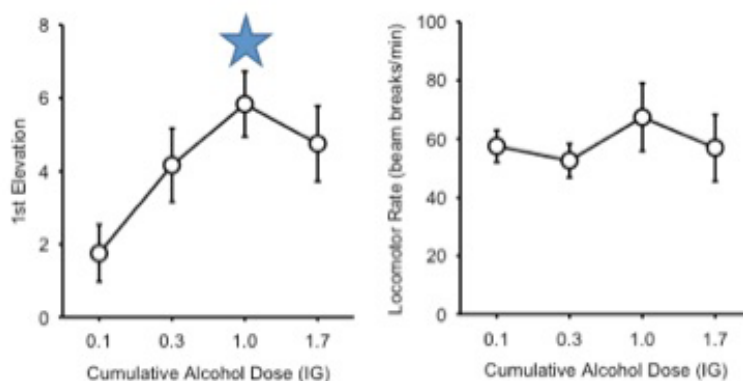


Figure 2: Confirmation of discriminative stimulus control by alcohol. (A) Using a one-way repeated measures ANOVA, the first elevation score was determined as statistically significant at the 1.0-g/kg alcohol dose with a p-value of 0.007 compared to the first elevation score for the 0.1 g/kg alcohol dose. Rats were trained at a 1.0 g/kg alcohol dose, so data collected is as expected. (B) There is no statistically significant interaction observed between alcohol dose and locomotor rate (beam breaks/min).

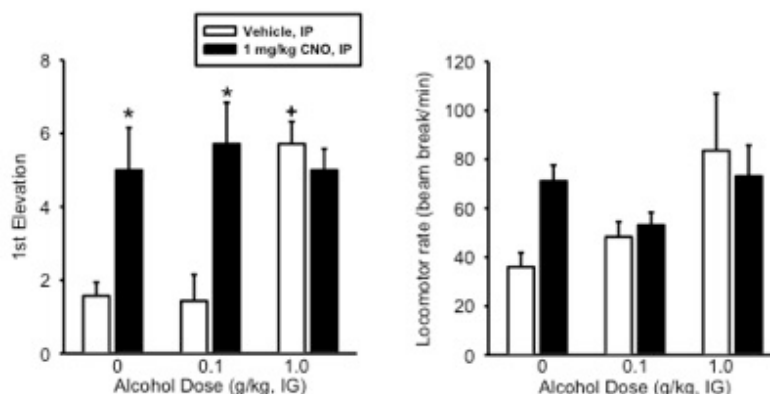


Figure 3: Inactivation of the Insular Cortex. (A) Using a two-way repeated measures ANOVA, there was a statistically significant interaction observed between CNO and alcohol. In the presence of CNO, subjects had a higher elevation score; without CNO, rats had a lower score. (B) There is no statistically significant interaction observed between alcohol dose and locomotor rate (beam breaks/min) in the absence or presence of CNO. Alcohol sensitivity did not affect locomotor activity.

dose in the presence or absence of CNO (See Figure 3A).

We see a difference in locomotor activity with a 0-g/kg-alcohol dose, but not at a 0.1-g/kg-alcohol dose or 1.0-g/kg alcohol dose. This increase in locomotor activity is not observed at the 0.1 and 1.0-g/kg alcohol doses. Summarily, there is no statistically significant interaction observed between locomotor rate and alcohol dose in the absence or presence of 1 mg/kg CNO (See Figure 3B).

Discussion

The purpose of this experiment was to analyze the role of the insu-

lar cortex (IC) in modulating alcohol sensitivity. This was accomplished by injecting rats trained to a 1.0-g/kg alcohol dose with the Gi DREADD to inactivate their insular cortex. IC inactivation did not disrupt discrimination of the training dose (1.0-g/kg) since the elevation score remained the same. However, IC inactivation in the presence of a smaller alcohol dose (0.1-g/kg) increased the elevation score to a level comparable to behavior in the presence of the 1.0-g/kg training dose. These results reveal that inactivation of the IC through the use of Gi DREADDS increases sensitivity to the discriminative effects of alcohol.

Proper discrimination behavior was evident by the cumulative alcohol dose curve. The highest elevation score at 1.0-g/kg was expected because this was the training dose. At alcohol doses lower than 1.0-g/kg, rats had smaller first elevation scores since the feeling of “drunkenness” was lighter. However, at a higher dose of alcohol (1.7-g/kg), the first elevation score goes down. Since subjects are not used to such a high dose of alcohol, their sensitivity to alcohol might become confounded.

No significant interaction between alcohol dose and locomotor activity suggests that alcohol sensitivity did not confound the ability of the rats to move around within the chamber. Although there is a difference at 0-g/kg dose of alcohol in the presence of CNO with increased locomotor activity, the rest of the data supports the implication that the locomotor activity of the rats stays the same no matter the presence or absence of alcohol and CNO.

Further direction can be taken by examining how IC inactivation affects alcohol consumption. While this experiment investigates their alcohol sensitivity by measuring head entries into the liquid receptacle and locomotor activity inside the chamber, it does not look at alcohol consumption. Although IC inactivation heightens their feeling of “drunkenness,” the question is how this would affect their desire to drink alcohol and in what amount. We could also use this as comparison to a sucrose self-administration group in order to see if one form of reward may be preferred over the other.

Finally, we assumed that the rats become more sensitive to the feeling of “drunkenness” due to IC inactivation. However, there is also the possibility that what they are not necessarily feeling increased sensitivity to alcohol. They may just be more motivated to seek food (i.e., sucrose in the case of the present experiment). We can assume that their sensitivity to alcohol has heightened, but there is also the possibility of other feelings that could interplay and cause a greater number of head entries into the liquid receptacle. The Gi DREADDS virus could also affect their pathological response to alcohol. These concerns call for more controls in order to separate the effects of IC inactivation and the virus itself. In addition, these questions could be further investigated with more alcohol doses, as our lab only used four. Ultimately, our data suggests IC plays a role in alcohol sensitivity since the result of its inactivation reveals more head entries into the liquid receptacle prior to the cue light. In other words, their heightened sensitivity to alcohol draws them more towards the liquid receptacle to seek a reward in the form of sucrose.

Works Cited

- “Alcohol Facts and Statistics.” National Institute on Alcohol Abuse and Alcoholism. N.p., n.d. Web. 29 Nov. 2015. <<http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-facts-and-statistics>>.
- Besheer, Joyce, Kristen R. Fisher, and Brandon Durant. “Assessment of the Interoceptive Effects of Alcohol in Rats Using Short-Term Training Procedures.” *Alcohol* (Fayetteville, N.Y.) 46.8 (2012): 747–755. PMC. Web. 30 Nov. 2015.
- Craig, A.D., How do you feel--now? The anterior insula and human awareness. *Nature reviews. Neuroscience*, 2009. 10(1): p. 59-70.
- Paulus, M.P. and J.L. Stewart, Interoception and drug addiction. *Neuropharmacology*, 2014. 76 Pt B: p. 342-50.



Verda Argan wanted to learn more about the neurobiology of addictive disorders after taking Intro to Psychology. She was specifically interested in what causes addiction, how drugs change the brain, and what populations are most vulnerable. Her curiosity regarding drug abuse and addiction first led her to a literature research position studying the effects of prenatal nicotine exposure on infants at the UNC Center for Developmental Science. Subsequently, she joined the behavioral neuropharmacology lab of Dr. Joyce Besheer, where she worked for two years as an undergraduate research assistant and completed several credit hours of independent research. Her research project focused on examining the functional role of the insular-striatal circuit in modulating the interoceptive effects of alcohol. Utilizing a Pavlovian drug discrimination technique, they were able to experimentally confirm their prediction that insular cortex

(IC) inactivation leads to greater sensitivity to alcohol.

Respiratory Sinus Arrhythmia Predicts Future Infant Sleep Quality and Emotional Reactivity to Stress

by Archita Chandra

This study examined the association between infant physiological self-regulation in baseline and stress-inducing scenarios and future sleep quality and emotional reactivity to stress. A sample of 89 healthy African American mother-infant dyads were recruited as part of the Neonatal and Pediatric Sleep study. Home visits were conducted when infants were 3 and 6 months of age. Baseline cardiac data was obtained at both time-points to assess RSA change (an index of physiological reactivity), sleep assessments were conducted for one week following the home visits at each time-point (from which actigraphy data was collected), and the still-face paradigm (SFP) was conducted at the 6 month time-point. Results showed significant associations between sleep and emotional reactivity during the SFP such that 6 month sleep efficiency was positively associated with neutral affect and negatively associated with positive affect in the normal episode of the SFP and amount of sleep minutes at 6 months was negatively associated with positive affect in the still-face episode of the SFP. In addition, significant links were found between sleep and RSA change in the SFP including a negative relationship between sleep efficiency at 3 months and self-regulation in the still-face episode of the SFP at 6 months and a negative relationship between 6 month sleep efficiency and RSA change from the normal to the still-face episodes of the SFP. These results suggest that there is a link between both early and concurrent sleep and emotional and physiological reactivity to stress.

Keywords: Infant RSA, Sleep, and Emotional Reactivity

Introduction

It is well known that early childhood experiences affect later developmental outcomes. What is relatively unclear, however, is how these experiences influence each other early in life to predict later development. This study explores the association between infant physiological reactivity during calm and stressful situations (via respiratory sinus arrhythmia) and infant sleep quality, concurrently and over time, and the subsequent relationship between early sleep quality and emotional reactivity during a stressful situation at 6 months. Understanding sleep development is important given that poor childhood sleep has been associated with behavioral problems, poor school and work performance, and poorer health in later development (Hinnant et al., 2011; Graziano et al., 2011). Moreover, the current study focuses on African American mother-infant dyads, due to previous findings that African

American children get less sleep than their counterparts and experience a greater prevalence of sleep disorders such as insomnia and sleep apnea (Lichstein et al., 2004). To date, no study has looked at the early origins of these disparities. Therefore, studying the determinants of early sleep quality and emotional reactivity has critical implications for behavioral and emotional development in later childhood and into adulthood.

Respiratory Sinus Arrhythmia

Respiratory sinus arrhythmia (RSA) is a parasympathetic measure of the vagus nerve's influence over heart rate and has been found to support behavioral regulation during stressful situations. Porges' polyvagal theory of social engagement (Porges, 1995) asserts that during times of no external demand or challenge, the "vagal brake" is engaged and parasympathetic control over the heart allows the body to focus on internal demands such as or-

gan growth and restoration – alternatively, this brake is removed (decreasing parasympathetic influence) during environmentally challenging scenarios so that the body can mobilize and focus on external demands (Propper et al., 2008). Thus, lower levels of RSA are typical in situations that require coping. When normal environmental conditions reemerge, the typical response is for RSA to increase and return to baseline levels followed by decreased heart rate, and less mobilization (Porges, 1995). Given that RSA is a non-invasive measure of one's internal state, RSA can be used to assess nonverbal infants' changes in internal state and coping to changing environments and interactions with mothers.

Individual differences in RSA change during challenging situations have been implicated in long-term developmental outcomes. A recent meta-analysis (of 44 studies) on the effects of RSA on future outcomes in children was conducted by Graziano and Derefinko (2013). One critical finding revealed that increased RSA withdrawal (i.e., lower RSA levels) in challenging situations was correlated with decreased externalizing and internalizing behaviors and reduced issues in cognitive and academic performance. For example, children who exhibited problematic externalizing behaviors also showed impaired RSA withdrawal in stressful scenarios, suggesting inadequate emotional and physiological self-regulation. Moreover, lower baseline and RSA withdrawal was found in children comprising clinical and at-risk populations as compared to children in healthy populations (Graziano & Derefinko, 2013). The results further showed that moderate RSA withdrawal in stressful scenarios was correlated with better emotional and developmental outcomes, suggesting that perhaps too much withdrawal, or not enough withdrawal, could be problematic.

Therefore, both baseline RSA and RSA withdrawal during a challenge are important correlates of child reactivity, regulation, and overall functioning. As such, it is reasonable to conclude that because RSA and RSA change are indicators of reactivity, this physiological system may predict sleep quality (a process that is dependent on being able to calm down, relax, and self-soothe). Thus, the current study will examine both baseline RSA as well as RSA change across the normal and still-face episodes of the still-face paradigm (SFP) as potential predictors of sleep quality. This experimental paradigm may be particularly interesting due to the physical and emotional separation from mother that occurs during the still-face episode that may mimic bedtime practices where mothers have to physically separate themselves from infants to allow the infants to fall asleep.

RSA and Sleep

Problems in sleep have been associated with inadequate emotion regulation and therefore higher levels of reactivity (Dahl, 1996). Due to the association between RSA and child neurodevelopmental outcomes, as described above, the existing literature has examined RSA as a pre-

dictor of sleep in preschool children (Elmore-Staton et al., 2012). Findings revealed that higher levels of baseline RSA predicted less restlessness during sleep (as indicated by less activity and movement during sleep) and more sleep efficiency, as measured by actigraphy, as well as more minutes asleep. However, while RSA has been associated with certain aspects of sleep, it is still not possible to identify causation between RSA and sleep quality measures given that sleep quality and RSA can impact each other such that atypical RSA levels may lead to poor sleep quality, which in turn may further alter parasympathetic (RSA) functioning (Elmore-Staton et al., 2012). It is also possible that early sleep patterns in the first months of life may shape RSA functioning by 6 months.

Similar relationships between physiological reactivity and regulation, emotional intensity, and future sleep quality can be seen in elementary school children (El-Sheikh & Buckhalt, 2005). In this age group, less RSA withdrawal in response to stressful scenarios is associated with sleep

problems, similar to the preschool age group. Interestingly, children exhibiting more emotional intensity also exhibit problems in sleep quality and quantity (El-Sheikh & Buckhalt, 2005), supporting Dahl's (1996) claim that problems in emotion regulation could affect sleep development. Due to the known associations between RSA and emotional reactivity (Gentzler et al., 2009; Fox, 1989), this suggests that RSA may play a role in sleep development. The current study is novel in that it expands on these findings by examining the physiological correlates of reactivity and regulation, rather than the behavioral ones, as predictors of infant sleep quality. While previous studies have examined the relationship between emotion reactivity and regulation and infant sleep quality, the current study will be the first to examine how infants' physiological reactivity and regulation are implicated in future sleep quality. This study will also be the first to look at these questions so early in life, starting at 3 months of age. Researchers further explain that RSA can be affected by environmental changes, which can influence the child via disruptions in sleep quality (El-Sheikh & Buckhalt, 2005). Thus, due to the plasticity of physiological systems across childhood, it is critical to look at these factors early in life.

RSA and Emotional Reactivity during the Still Face Paradigm

The still-face paradigm (SFP) is an activity used to assess infant-mother interactions and can be used to assess infants' emotion regulation abilities in stressful scenarios. Previous studies have examined fluctuations in infant RSA levels during different parts of the SFP in order to assess reactivity and regulation. One study examined the influence of mother-infant interactions on RSA in 3-month-old infants during the SFP (Moore & Calkins, 2004). Results showed that higher infant RSA withdrawal during the still-face episode was associated with greater negative affect, and no RSA withdrawal in the still-face episode was associated with less synchrony with mothers in the normal

play episode, and less positive affect and more reactivity in the normal play and reunion episodes of SFP (Moore & Calkins, 2004). Therefore, RSA withdrawal throughout the paradigm appears to be a meaningful measure of emotional reactivity. Additionally, another study conducted by Bosque et al. (2014) found similar RSA and emotional fluctuations such that the still-face episodes were associated with increased negative/distressed infant affect while reunion episodes were associated with somewhat decreased negative affect. Furthermore, RSA decreases were seen during the still-face episode and although they increased again during the reunion episode, they still did not reach baseline levels.

Sleep and Emotional Reactivity

Sleep has been implicated in many adult studies as a significant influencer of mood and emotional reactivity. In particular, Pilcher and Huffcutt (1996) conducted a meta-analysis of existing studies on adult sleep and emotional reactivity. They found that of cognitive, motor, and emotion development, emotion and mood were the most affected by sleep deprivation in adults. Additionally, partial sleep deprivation had the most detrimental effects on emotion and emotion regulation than long or short-term sleep deprivation.

In contrast, literature regarding childhood sleep and emotion regulation is somewhat mixed. Sadeh (2007) notes in a review that studies on children show relatively few associations between sleep and emotion regulation. Of the studies that did find an association, the study conducted by Smaldone, Honig, & Byrne (2007) found that among school-aged children and adolescents, those with poorer or lack of sleep were reported by parents to more likely have issues in school and health problems. In particular, parents were more likely self-report children with poorer or inadequate sleep as having depressive symptoms and argued in family disputes. Similarly, Wolfson & Carskadon (1998) found correlations between shorter amount of sleep in adolescents and depressive symptoms. In contrast, Naylor et al. (1993) found that sleep deprivation in clinically depressed adolescents decreased depressive severity in these subjects. As such, the literature on the relationship between sleep quality and emotion regulation suggests that lack of sleep or poorer sleep quality may have mixed effects on mood and emotion. The current study attempts to examine whether these effects of sleep on emotion are seen in infancy, an earlier time-point than those in the literature discussed. This can help to identify if early sleep quality has significant implications for emotional development later in life.

RSA in African American Populations

Research on the differences in RSA on behavioral and health outcomes is scant in the literature. One longitudinal study of RSA development in children from diverse ethnic and racial backgrounds revealed a key difference in RSA between Caucasian and African-Americans (Hinnant et al.,

2011). Specifically, this study found that African-American children exhibited spikes in baseline RSA compared to the Caucasian children, but minimal long-term RSA increases over the two-year study period. Additionally, impaired RSA withdrawal has been found to be a significant risk factor for future pediatric obesity or overweight status in African American children and adults (Graziano et al., 2011). As such, although both the child and adult literature on RSA and development across race is sparse, the available literature suggests that there is a distinct difference in how RSA relates to outcomes within an African American population. It should be noted that most of the existing literature on racial differences in RSA focuses on the effects of these differences on health, whereas fewer studies have discussed the effects of these differences on behavior. Thus, the current study focuses solely on an African American sample to better understand the influence of RSA on sleep development within this population, which is particularly critical due to the differences in sleep quality found across race (Lichstein et al., 2004).

Current Study

This study examines the relationships between RSA and sleep quality at 3 and 6 months of age. In addition, we examine the relationship between sleep and emotional reactivity in the still-face paradigm, as a first step towards understanding the complex relationships between RSA, sleep, and emotional reactivity. Moreover, this study is the first to look at these relationships in an African-American sample. The three specific questions and hypotheses are as follows:

1. Is baseline RSA at 3 months of age related to sleep quality at 3 and 6 months of age? We hypothesize that baseline RSA at 3 months will be positively associated with measures of sleep quality at 3 and 6 months (i.e., the amount of sleep minutes, sleep efficiency, and night-sleep ratio).
2. Is RSA change from the normal episode to the still-face episode of the SFP (indicating physiological reactivity) associated with sleep quality at 6 months? We hypothesize that higher levels of RSA withdrawal (indicating higher levels of reactivity) during the still-face episode will be associated with worse sleep quality at 6 months.
3. Is sleep quality at 3 and 6 months associated with behavioral indices of emotion reactivity (i.e., positive, negative, and neutral affect and self-regulatory behaviors) during the SFP at 6 months? We hypothesize that better sleep quality at 3 and 6 months (i.e., amount of sleep minutes, sleep efficiency, and night-sleep ratio) will predict less emotional reactivity (i.e., positive, negative, and neutral affect and self-regulatory behaviors) during the SFP at 6 months.

Methods

Participants

This study is comprised of 89 African American moth-

er-infant dyads from the Neonatal and Pediatric Sleep (NAPS). Families were recruited via public birth records and through advertisements in the community, and families were included only if they intended to remain in the study region (the Raleigh-Durham-Chapel Hill research triangle in North Carolina) for the following 12 months. Full term healthy infants with no known developmental disorders were enrolled; 49 were male (55.1%) and 40 were female (44.9%) with a mean age of 108.4 days ($SD = 13.87$) at the 3 month visit and 195.62 days ($SD = 13.95$) at the 6 months visit. Sixty-one mothers were employed (68.5%); 27 had some amount of college experience but no degree (30.0%), 20 had a graduate degree (22.2%), and 15 had a bachelor's degree (16.7%). 38 mothers were married (42.7%), 33 were never married (37.1%), and 10 were living with someone but were not married (11.2%). The average income level of the participating families was \$55,348.88 ($SD = \$41,916.56$).

Procedures

Mother-infant dyads were seen at a home visit that lasted between 60 and 90 minutes when infants were 3 and 6 months of age. At the start of the first visit, mothers completed consent forms, and each visit required mothers to complete various questionnaires regarding infant behavior, temperament, and sleep patterns in addition to mothers' own psychological functioning as well as demographic information such as family income, education level, race, and infant's sex. Trained research assistants placed heart rate monitors on the infants at the beginning of each home visit and recorded a 4 minute baseline reading. During baseline recording, mothers were told to not hold or interact with the infants in any way. Infants continued to wear monitors throughout the visit during several video-recorded infant assessments and dyadic interactions (the ones included in the current study are described below).

Sleep assessments were conducted during the week following the 3 and 6 month home visits. For these, infants wore a lightweight actigraph on their leg for seven nights. Sleep diaries were conducted by phone, with mother, every day of the sleep assessment week in order to record patterns in mother and infant sleep over 24 hours. Participating families were reimbursed with gift cards at each time point.

Measures and Materials

Actigraphy

Actigraphy is an objective measure of sleep that records amount of activity in 15-second epochs. Actigraphy data was obtained via Actiwatch 2 motion watches, which infants wore on their ankles, continuously for 7 days. Data was analyzed using Phillips Respironics software (version 6.0.7).

Actogram Editing

Editing of actograms require changes to the actogram's algorithm settings depending on the purpose of individual research and the age at which data was collected (So et al, 2005). In addition, editing actograms required the

researcher to include custom intervals when the software failed to include an appropriate interval. Additionally, only one coder coded actogram data at each time-point of 3 and 6 months. Comparisons between behavioral bedtime videos and actogram editing ensured a correspondence between included or excluded sleep and wake intervals in the actogram with what was behaviorally observed.

At 3 months, the number of Immobile Minutes for Sleep Onset and the Immobile Minutes for Sleep End were both set to 5 and the Wake Threshold was set to the automatic setting. The Actogram Start Hour was set to 12:00AM. At 6 months, the Wake Threshold was set to the low setting and the Minimum Rest Interval Size was set to 20. Additionally, actograms were programmed by researchers to Automatically Set Minor Intervals rather than the system's standard to Detect only one Rest Interval per day.

Existing rest intervals were modified if the software erroneously incorporated large amounts of activity in the rest interval. Rest intervals were added if sporadic activity indicative of restless sleep was seen in a time period of at least 20 minutes. Sporadic activity was defined as periods of activity less than five minutes long, not clustered within 5 minutes of each other, and of less intensity than activity characteristic of wake states. Activity was considered as indicative of a wake state if the activity period in question was longer than five minutes and if the average amount of activity within the interval surpassed 40. In such cases, forced wake intervals were added.

Actigraphy Data Reduction

The following variables are included in analyses: amount of sleep minutes and sleep efficiency. Sleep efficiency reflects the total amount of time spent in the sleep context (any place where a baby is put to sleep, such as the crib, bassinet, or in mothers arms) where the infant is asleep; in other words, the ratio of sleep intervals to rest intervals that may act as an index of how easily infants fall asleep and stay asleep. In contrast, amount of sleep minutes relays the length of time that infants were asleep. These variables are representative of only night sleep and did not include aspects of day sleep or naps. One final variable, the night sleep ratio, does take daytime sleep into account and was created by dividing the amount of nighttime sleep minutes by the average amount of total sleep that infants got in a 24 hour period. The formula used to create this was $n/(n+d)$, where n = average night sleep minutes across the seven-day sleep study period and d = average day sleep minutes across the study period.

Still-Face Paradigm (SFP)

The Still Face Paradigm (SFP) was recorded for later coding. During this task, mothers and infants sat facing each other for three two-minute episodes. In the first episode (the "normal episode"), the dyads interacted normally. In the next episode (the "still-face episode"), the mothers stared at infants with an expressionless face and were told to be unresponsive to infant cues. In the final episode (the "reunion episode"), the mothers resumed normal interac-

tion. Note that any episode of the SFP (normal, still-face, or reunion) could be cut short if the infant displayed extreme distress.

Interactions were coded for infants and mothers across all 3 episodes of the SFP in 5 second intervals. For each interval, infant affect was coded as positive, negative, and neutral expressions. Infant self-regulation was coded only during the still-face and reunion episodes and included any rhythmic and purposeful action done by the infant on another object or on itself in order to soothe itself or direct attention away from a stressor. Examples of behaviors coded as self-regulatory include feet-grabbing, thumb-sucking, self-stroking, self-clasping, fidgeting with the car-seat or other item, rhythmic body rocking, or rhythmic arm motions. Behaviors would not be considered as self-regulatory if the mother initiated the behavior by presenting an object to the infant that it used to self-regulate. Additionally, composite ratios for infant affective expression and self-regulatory behavior codes were calculated for analyses. Composite ratios were created for each episode by dividing the total number of instances of each of the codes described above by 24 (total number of possible intervals in each of the 3 episodes).

Respiratory sinus arrhythmia (RSA).

Respiratory sinus arrhythmia (RSA) is a parasympathetic measure of self-regulation. Actiwave Cardio heart-rate monitors developed by CamNtech were placed on infants' chest (from sternum to left rib) using neonatal electrodes to obtain RSA data. A 4-minute baseline measure of RSA was obtained at both home visits and RSA was collected during the SFP at 6 months. Once downloaded onto lab computers, the data was segmented into baseline episode and the multiple episodes of the SFP. Prior to RSA calculation, R-waves were identified by a computer algorithm and any missing or incorrect R-waves were edited manually using the CardioEdit software (Porges, 1985). Incorrect R-waves were identified by outliers that were far above or far below the typical pattern of points that surrounded the outliers and that made up the wave. Incorrect R-waves were edited by summing, dividing, or averaging the outliers with each other or with adjacent points so as to make the outliers consistent with the typical pattern of the surrounding points of the R-wave. Outliers creating incorrect R-waves could be due to excess noise picked up by the heart rate monitors, which could be caused by a range of factors including infants or mothers tampering with the monitors and accidental removal of the monitors. RSA was calculated in 30 second epochs over the 4 minute baseline and each two-minute episode of the SFP using the Porges method (1985). Average RSA values across all epochs were then obtained per episode via CardioBatch Plus software for further analyses. Additionally, change in RSA between the normal and still-face episodes of the SFP was calculated as follows:

$$\text{RSAchange} = \text{RSA6mSFPnormal} - \text{RSA6mSFPstillface}$$

Results

Descriptive Data

Means, standard deviations, and Ns for all predictors, outcomes, and covariates are found in Table 1. Reasons for variation in sample size (i.e., missingness) across variables include: equipment failure, refusal, and infant distress. Equipment failure refers to issues in the initial recording of the data during home visit procedures as well as problems in downloading data files at the lab. Additionally, mothers had the right to refuse participation in any one procedure (i.e., SFP or overnight actigraphy) or withdraw from the study at any time. Mothers could also refuse to report certain demographic data or may have incorrectly reported demographic data in questionnaires. Finally, infants were sometimes very distressed, resulting in the SFP either being cut short or not being conducted at all and RSA files that could not be edited or used due to excessive movement or pressure on monitor. For these reasons, there are variations in sample size for each of the individual study variables.

Correlations between demographic variables and primary study variables

Correlations were examined between years of education, infant sex, and primary study variables (sleep, SFP, and RSA variables; see Tables 2 – 3). Independent samples t-tests and correlations were run to analyze the relationship between potential covariates and primary study variables. With regards to infant sex, males displayed significantly more negative affect during the reunion episode of the SFP at 6 months, ($t(60) = -2.296, p < .025$). Although maternal years of education was not significantly correlated with primary study variables, it will be included as a covariate in subsequent models acting as a proxy for current socioeconomic status (rather than family income, which was more likely to be missing or inaccurate, perhaps due to the sensitivity of this question). Therefore, maternal years of education and infant sex will be included as covariates in all regression models.

Hypothesis 1: Associations between 3 month baseline RSA and 3 and 6 month sleep quality

Linear regressions were conducted to predict 3 and 6 month sleep measures (i.e., sleep efficiency, amount of sleep minutes, and night-sleep ratio) from infants' 3 month baseline RSA. After controlling for infant sex and maternal education, there were no significant relationships.

Hypothesis 2: Associations between 6 month RSA change during the SFP and 6 month sleep quality

Linear regressions were conducted to predict infant RSA change during the SFP from concurrent sleep measures (i.e., sleep efficiency, amount of sleep minutes, and night-sleep ratio) at 6 months. After controlling for infant sex and maternal education, sleep efficiency marginally predicted RSA change from normal to still-face episodes in the SFP ($\beta = -.295, p < .059$).

Hypothesis 3: Associations between 3 and 6 month sleep quality and 6 month SFP emotional reactivity

Linear regressions were conducted to predict emotional reactivity during the SFP (i.e., neutral, negative, and positive affect and self-regulation) at 6 months from infants' sleep quality (i.e., sleep efficiency, amount of sleep minutes, and night-sleep ratio) at both 3 and 6 months. Amount of sleep minutes at 3 months significantly predicted self-regulation during the still-face episode of the SFP at 6 months ($\beta = -.316$, $p < .014$) above and beyond maternal years of school.

In addition, 6 month sleep efficiency significantly predicted neutral affect ($\beta = .299$, $p < .040$) and positive affect ($\beta = -.384$, $p < .007$) during the normal episode of the SFP. Finally, amount of sleep minutes at 6 months of age marginally predicted positive affect in the still-face episode of the SFP ($\beta = -.268$, $p < .060$).

Discussion

This study examined the relationships between infant physiological reactivity, sleep quality, and emotional response to stress at 3 and 6 months of age. Overall, among the different aspects of sleep quality (sleep efficiency, amount of sleep minutes, and night-sleep ratio), physiological reactivity (baseline RSA, RSA during each individual episode of the SFP, and RSA change from the normal to the still-face episodes of the SFP), and emotional reactivity (neutral, positive, and negative affect and self-regulation), several associations were found. The following discussion will summarize these findings and provide potential interpretations, limitations, and future directions.

For the first hypothesis, we expected a positive relationship between baseline RSA at 3 months of age and sleep quality at 3 and 6 months (as measured by sleep efficiency, amount of sleep minutes, and night-sleep ratio). No significant correlations were found. One possible reason for this is that 3 months may be a time in which physiological processes (both RSA and sleep) may not yet be consolidated, and thus are highly variable without clear patterns. RSA functioning may still be developing and thus may not yet have a direct relationship with concurrent or future sleep quality. The extant literature that has found relationships between early RSA and other measures of development, such as sleep, have looked at preschool and elementary-school age children (Elmore-Staton et al., 2012; El-Sheikh & Buckhalt, 2005), suggesting that earlier measures of RSA may not be reliably related to later developmental outcomes, which supports the current study's findings. It may be the case that 3 months of age is still too young to see this type of predictive relationship. Of course, an additional possibility is that RSA and sleep at this age are independent processes and do not, in fact, influence one another as we had expected. Thus, future studies on RSA should focus more on disentangling other aspects of infant physiological functioning to determine which ones play a role in sleep development, and at what point in development this begins to happen.

For our second question, we expected a negative association between RSA change from the normal to still-face episodes of the SFP and 6 month sleep quality (as measured by sleep efficiency, amount of sleep minutes, and night-sleep ratio). We found a significant relationship between one measure of sleep (sleep efficiency) and RSA change. As described above, RSA typically decreases during stressful scenarios as an indicator of physiological reactivity. Thus, a decrease in RSA between the normal and still-face episodes of the SFP indicates that infants are more physiologically reactive to the highly potent stressor of maternal emotional separation. Our findings revealed that increased sleep efficiency at 6 months predicted less RSA change between the normal and still face episodes of the SFP. Recall that sleep efficiency represents the ratio of time spent asleep during a rest interval. For example, an infant may be laid down in their crib or bed, but remains awake for several minutes in a restful state; this variable provides an estimate of the proportion of time sleeping once in a rested state, which may provide some information about an infant's ability to soothe to sleep. The current study's findings suggest that more sleep efficiency at 6 months is associated with less RSA decrease during the still-face episodes of the SFP (an episode that typically elicits distress and subsequent RSA decreases).

Several possible explanations could account for this finding. One explanation could be that improved sleep leads to decreased physiological reactivity to stress. Infants who sleep more efficiently (as measured by more time spent asleep as opposed to simply resting) may be less reactive and irritable to stressors in general due to the fact that they are well rested. In contrast, another explanation may be that infants who are less reactive to stress (as indicated by less RSA withdrawal between normal and still-face episodes of the SFP) may be less aroused or better able to self-soothe than infants who are more physiologically reactive to stress, resulting in these infants being better able to soothe themselves to sleep more easily. Note that RSA change from the normal to the still-face episodes of the SFP was used because this maternal separation may elicit physiological and emotional responses in infants similar to those elicited by maternal physical separation at bedtime.

There are several factors that may also account for this relationship that were not included in the current study. Infant temperament may be a third unmeasured variable-influencing the given findings, such that a calm, easily soothed, less negative infant may just be easier across all contexts. Indeed, the positive correlation found between 3 month baseline RSA and 6 month RSA in both the normal and still-face episodes of the SFP suggests that the physiological underpinnings of temperament may be stable over time. Another explanation may be early adjustments to fluctuations in family environment. It is possible that maternal sensitivity and emotional responsiveness to infants throughout the day fluctuate given family socioeconomic status. For example, mothers with less education

likely have less income and may be working multiple jobs in order to support the family, which may result in mothers being less physically and emotionally available to infants' distress. In response, infants of these mothers may develop more efficient mechanisms of self-soothing and less reactivity as a coping mechanism, resulting in these infants potentially being less reactive to maternal emotional separation at bedtime and during the still-face episode of the SFP.

The findings for the second hypothesis seem somewhat at odds with the existing literature on the relationship between RSA and sleep. In particular, El-Sheikh & Buckhalt (2005) found that decreased RSA withdrawal to stressful stimuli in elementary-school children was associated with problems in sleep and that those exhibiting more emotional intensity were also likely to have problems with sleep. Interestingly, the current study found that increased withdrawal was related to better sleep. This difference could be due to developmental processes, such that RSA withdrawal in infancy (when there is less cognitive control) may act differently than in elementary school (where children are better able to control emotional response). Also, it could be due to differences in measurement; our study focused on a task that elicits distress, fear, and frustration due to maternal separation, and the El-Sheikh and Buckhalt study was based on the Sternberg memory scanning task, which demanded children's attention but did not elicit much distress (2005). Moreover, the current study's findings are at odds with El-Sheikh et al.'s (2012) results given that the current study found that improved sleep quality was associated with less RSA withdrawal in stressful situations. As such, future studies should replicate the current study paradigm and control for the possible confounds, outlined above, that may have influenced or mediated the findings for this hypothesis.

Finally, the third hypothesis suggested a negative association between 3 and 6 month sleep quality (as measured by sleep efficiency, amount of sleep minutes, and night-sleep ratio) and emotional reactivity during the SFP at 6 months (as measured by neutral, positive, and negative affect and self-regulation). The first significant relationship that emerged was that increased sleep efficiency at 3 months negatively predicted self-regulatory behaviors in the still-face episode of the SFP at 6 months. In other words, sleep efficiency at 3 months (as measured by time spent asleep during a rest interval) predicted less self-regulation during stress at 6 months. One explanation for this finding could be that sleep may have beneficial protective effects that could buffer the effects of negative stressors, leading to a more calm state with less arousal or reactivity, thus making it unnecessary for infants to behaviorally self-regulate. Another possibility is that the same characteristics that help some infants easily soothe to sleep may also lead to a generally calmer and less reactive state, such that the SFP does not elicit the same distress, or need to self-regulate, as it does for other babies.

Significant relationships were also found between 6

month sleep quality and concurrent emotional reactivity to the SFP. In particular, sleep efficiency at 6 months positively predicted neutral affect and negatively predicted positive affect, both in the normal episode of the SFP.

These findings can be explained by one of several possible explanations. The first one draws upon the earlier explanation that infants who more easily fall asleep (as indexed by sleep (efficiency) may not be as reactive in general and may tend to be more neutral or calm. It makes sense, then, that because there is more neutral affect associated with sleep efficiency, that there would be less emotional reactivity. In this case we only found this to be the case with positive affect, not negative affect. It also could be that infants who are very positive during interactions with their mothers have a good dyadic relationship which brings them joy and comfort. For those infants, it may be harder to separate from mothers at bedtime and it may take them longer to fall asleep. Our finding of less sleep efficiency in more positive infants during normal episode of the SFP fits with this conclusion. However, what is ambiguous about this explanation is the source of variation in infant reactivity, which could again be either temperamental differences or the effects of socioeconomic factors influencing maternal presence and sensitivity to infant distress (thus influencing the quality of the mother-infant relationship). As such, future studies should aim to more conclusively determine the directionality and causality of the relationship between infant sleep quality and concurrent emotional reactivity.

Finally, although only marginally significant, the amount of sleep minutes at 6 months negatively predicted concurrent positive affect in the still-face episode of the SFP. This finding is in line with our hypotheses. Showing less positivity during the still-face episode is an expected reaction given that this episode is meant to induce distress and negativity in infants. This finding may indicate that rather than showing more negativity in distress, the appropriate response for infants would be to show less positivity. Given this explanation, the findings would suggest that well rested infants who are sleeping better (as indicated by greater amount of sleep minutes) are able to respond more appropriately in distress than infants who exhibit poorer sleep. However, future studies must include temperament and maternal sensitivity in order to more definitively understand the mechanisms at play in these results. Additionally, given this marginal significance, future studies are needed to replicate these findings with a larger sample size.

These findings add to the existing literature on the relationship between sleep and emotional reactivity. Adult studies on sleep and emotion regulation show a strong relationship between sleep and mood (Pilcher & Huffcutt, 1996). However, studies on children have not found many causal relationships between sleep and emotion regulation. Of the correlative studies, less sleep and more restless sleep has been associated with inadequate emotion regulation, negative emotionality, and depressive or anx-

ious tendencies (Smaldone, Honig, Byrne, 2007; Wolfson & Carskadon, 1998). Interestingly, one study found an association where less sleep resulted in a decrease in depressive symptoms in children who were clinically depressed (King et al., 1987; Naylor et al., 1993). Thus, the existing literature seems inconclusive regarding the effects of poor infant sleep on future or concurrent emotion regulation.

Although this study revealed interesting findings, some limitations must also be taken into account. First, the current study includes variation in sample size for each of the sleep, physiological reactivity, and behavioral variables. Not all subjects of the larger sample underwent all the procedures and activities during home visits at both time-points due to various factors, including infant temperament issues as well as problems in equipment and data collection. Some of this missingness may not be random, as the infants who are most distressed may have had the most problems with “messy” data or trouble completing tasks. As such, future research should aim for a larger sample size across all primary study variables.

Another key limitation would be the lack of contextual variables during sleep measurement. For example, sleep efficiency includes infants that are both cradled by mothers as well as infants who were placed into cribs to fall asleep on their own. Both scenarios have significant implications for data interpretation. If infants were still being rocked by mothers, then efficiency variables would be inflated because infants are given a lot of help and are not necessarily self-soothing. In contrast, if efficiency was calculated once mothers had placed infants in the crib, then results may be deflated given that many infants might experience distress due to maternal separation. We did not take these various scenarios into account for this study, thus future research should corroborate efficiency data with behavioral videos.

Despite these limitations, the results of this study are key for understanding how infant physiological reactivity influences future sleep and emotional reactivity to stress. The overall conclusion from the main study aims’ results is that early sleep quality and physiological reactivity are not adequate predictors of future sleep development, emotional reactivity, and physiological reactivity to stress. It appears that sleep quality at 6 months, and concurrent physiological reactivity (perhaps due to the consolidation of both systems that has occurred by this later time), would be better factors to consider in assessing sleep development and emotional and physiological reactivity at this age.

Acknowledgements

I would like to thank Dr. Cathi Propper for her supportive guidance and mentorship as my thesis advisor and throughout my time at the Propper Lab. I am grateful for the opportunities that Dr. Propper gave me as a volunteer and an honors thesis student at the lab. All of my experiences have enhanced my knowledge of the research process and further developed my passion for research in developmental psychology. Thank you, Dr. Propper, for understanding my joys and frustrations over my results and

for providing instrumental feedback and reviews of my thesis. I also want to thank Dr. Martha Cox for encouraging my interest in research by guiding me to Dr. Propper’s lab and for being on my thesis committee. Thank you to Marie Camerota for introducing me to the world of actigraphy, helping me in data editing and in better understanding infant sleep, and for being on my thesis committee. And thank you to Noa Gueron-Sela for introducing me to the still-face paradigm and respiratory sinus arrhythmia and for helping me with my data editing and coding, despite being halfway across the world. I would also like to thank Dr. Beth Kurtz-Costes and Dr. Peter Ornstein for being such supportive Honors Thesis Directors and instructors and for providing all of us honors thesis students with amazing resources and opportunities to practice presenting our work.

Next, I would like to thank my family and friends for their incredible support throughout this journey. Thank you to my parents, Meenal and Akhilesh Chandra, for constantly encouraging me to follow my dreams in research and for sharing in my enthusiasm over the development of this thesis. Thank you to my amazing friends, Jan and Brigh, for listening to my excitement about my thesis and providing me with feedback in practice presentations, and thank you to Rachel and Sophia for understanding all the struggles and joys of writing a senior honors thesis as we all developed our theses in the Propper Lab this year.

Works Cited

1. Bosquet Enlow, M., King, L., Schreier, H. M., Howard, J. M., Rosenfield, D., Ritz, T., & Wright, R. J. (2014). Maternal sensitivity and infant autonomic and endocrine stress responses. *Early Human Development*, 90(7), 377–385. <https://doi.org/10.1016/j.earlhumdev.2014.04.007>
2. Dahl, R. E. (1996). The regulation of sleep and arousal: Development and psychopathology.
3. *Development and Psychopathology*, 8(1), 3–27. <https://doi.org/10.1017/S0954579400006945>
4. Elmore-Staton, L., El-Sheikh, M., Vaughn, B., & Arsiwalla, D.

Table 1. Descriptive Statistics

Measure	N	Mean	Std. Deviation	Min	Max
Demographics					
Maternal Years of School	84	14.70	2.194	12	18
Age of Infants at 3 Month Time-Point (Days)	89	108.4	13.87	80	155
Age of Infants at 6 Month Time-Point (Days)	79	195.6	13.95	168	254
Sleep Quality					
3 Month Sleep Efficiency	79	84.89	5.481	68.79	93.55
3 Month Amount of Sleep Minutes	79	473.9	65.06	292.0	603.1
3 Month Night-Sleep Ratio	79	.7308	.0789	.5078	.9103
6 Month Sleep Efficiency	70	80.35	4.537	68.63	89.29
6 Month Amount of Sleep Minutes	70	448.0	49.86	297.6	563.6
6 Month Night-Sleep Ratio	70	.7751	.0666	.5624	.9761
SFP Emotional Reactivity					
Neutral, Normal Ep, SFP	70	.4292	.2675	0	1
Positive, Normal Ep, SFP	70	.4279	.2919	0	.9583
Negative, Still-Face Ep, SFP	70	.4250	.3821	0	1
Neutral, Still-Face Ep, SFP	70	.4095	.3778	0	1
Positive, Still-Face Ep, SFP	70	.0655	.1169	0	.5
Negative, Reunion Ep, SFP	70	.2946	.3441	0	1
Neutral, Reunion Ep, SFP	70	.2113	.2235	0	.875
Positive, Reunion Ep, SFP	70	.2607	.2728	0	.7917
Self-Regulation, Still-Face Ep, SFP	70	.5226	.3043	0	1
Self-Regulation, Reunion Ep, SFP	70	.2304	.2956	0	1
RSA					
3 Month Baseline RSA	67	3.440	.8739	1.87	5.54
6 Month RSA, Normal Ep, SFP	59	3.855	.8896	1.56	5.47
6 Month RSA, Still-Face Ep, SFP	56	3.782	1.004	.87	5.69
6 Month RSA, Reunion Ep, SFP	50	3.803	.9274	1.64	5.93
6 Month RSA Change from Normal to Still-Face	56	.0755	.7072	-1.58	2.18

Table 2. Associations between Sleep and RSA

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Sleep Eff (3)	-	.688**	.239*	.305*	.241	-.062	.022	-.175	-.004	-.023	-.127
2. Sleep Mins (3)		-	.536**	.242	.387**	.146	.023	.012	.032	.139	-.021
3. Night-Sleep (3)			-	.147	.195	.375**	.029	.257	.212	.28	.046
4. Sleep Eff (6)				-	.495**	.201	.137	-.061	.147	-.063	-.303*
5. Sleep Mins (6)					-	.415**	.092	.014	.079	.021	-.134
6. Night-Sleep (6)						-	-.028	.227	.14	.219	.018
7. Baseline RSA (3)							-	.409**	.487**	.303	-.257
8. N, SFP, RSA (6)								-	.718**	.775**	.154
9. SF, SFP, RSA (6)									-	.859**	-.577*
10. R, SFP, RSA (6)										-	-.337*
11. cRSA: N → SF (6)											-

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Note: Sleep Eff (3) = 3 Month Sleep Efficiency; Sleep Mins (3) = 3 Month Amount of Sleep Minutes; Night-Sleep (3) = 3 Month Night-Sleep Ratio; Sleep Eff (6) = 6 Month Sleep Efficiency; Sleep Mins (6) = 6 Month Amount of Sleep Minutes; Night-Sleep (6) = 6 Month Night-Sleep Ratio; Baseline RSA (3) = 3 Month Baseline RSA; N, SFP, RSA (6) = 6 Month RSA, Normal Episode, SFP; SF, SFP, RSA (6) = 6 Month RSA, Still-Face Episode, SFP; R,

SFP, RSA (6) = 6 Month RSA, Reunion Episode, SFP; cRSA: N → SF (6) = 6 Month RSA Change from Normal to Still-Face Episodes

Table 3. Associations between Sleep and the SFP

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Sleep Eff (3)	-	.688**	.239*	.305*	.241	-.062	-.001	-.084	.048	-.036	-.269*	.044	-.098	-.137	-.188	-.124
2. Sleep Mins (3)		-	.536**	.242	.387**	.146	.041	-.151	-.029	-.077	-.089	.018	.027	-.146	-.331**	-.115
3. Night-Sleep (3)			-	.147	.195	.375**	-.138	-.004	-.006	-.131	.145	.000	.056	-.196	-.066	-.118
4. Sleep Eff (6)				-	.495**	.201	.323*	-.389**	.153	-.005	-.175	.232	-.127	-.134	.009	-.086
5. Sleep Mins (6)					-	.415**	.238	-.191	.106	.063	-.263*	.087	.001	.098	-.021	.171
6. Night-Sleep (6)						-	-.006	-.036	.083	-.11	.063	.064	-.046	.024	.022	.072
7. Neut, N, SFP							-	-.596**	-.226	.401**	-.221	.088	.318**	-.144	-.023	.01
8. Pos, N, SFP								-	-.017	-.05	.328**	-.183	-.082	.353**	.212	.094
9. Neg, SF, SFP									-	-.835**	-.310**	.544**	-.383**	-.173	-.178	-.141
10. Neut, SF, SFP										-	.131	-.344**	.463**	.246*	.376**	.245*
11. Pos, SF, SFP											-	-.361**	.400**	.456**	.152	.18
12. Neg, R, SFP												-	-.381**	-.454**	-.061	.005
13. Neut, R, SFP													-	.350**	.17	.322**
14. Pos, R, SFP														-	.243*	.252*
15. SR, SF, SFP															-	.442**
16. SF, R, SFP																-

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Note: Sleep Eff (3) = 3 Month Sleep Efficiency; Sleep Mins (3) = 3 Month Amount of Sleep Minutes; Night-Sleep (3) = 3 Month Night-Sleep Ratio; Sleep Eff (6) = 6 Month Sleep Efficiency; Sleep Mins (6) = 6 Month Amount of Sleep Minutes; Night-Sleep (6) = 6 Month Night-Sleep Ratio; Neut, N, SFP = Neutral Affect, Normal Episode, SFP; Pos, N, SFP = Positive Affect, Normal Episode, SFP; Neg, SF, SFP = Negative Affect, Still-Face Episode, SFP; Neut, SF, SFP = Neutral Affect, Still-Face Episode, SFP; Pos, SF, SFP = Positive Affect, Still-Face Episode, SFP; Neg, R, SFP = Negative Affect, Reunion Episode, SFP; Neut, R, SFP = Neutral Affect, Reunion Episode, SFP; Pos, R, SFP = Positive Affect, Reunion Episode, SFP; SR, SF, SFP = Self-Regulation, Still-Face Episode, SFP; SF, R, SFP = Self-Regulation, Still-Face Episode, SFP

Table 4. Regression Analysis for Sleep Efficiency Predicting Concurrent Change in RSA in the SFP

Measure	B	Std. Error	β	P-value
Constant	2.913	2.106		.174
Maternal Years of School	.039	.049	.12	.432
Infant Sex	.156	.22	.107	.482
6 Month Sleep Efficiency	-.045	.023	-.295	.059

Table 5. Regression Analysis for Amount of Sleep at 3 Months Predicting Self-Regulation in the Still-Face Episode of the SFP

Measure	B	Std. Error	β	P-value
Constant	1.998	.363		.000
Maternal Years of School	-.041	.015	-.317	.011
Infant Sex	-.115	.071	-.199	.113
3 Month Amount of Sleep	-.001	.001	-.316	.014

Table 6. Regression Analysis for 6 Month Sleep Efficiency Predicting Neutral Affect in the Normal Episode of the SFP

Measure	B	Std. Error	β	P-value
Constant	-.889	.715		.219
Maternal Years of School	-.01	.016	-.084	.530
Infant Sex	.022	.077	.041	.773
6 Month Sleep Efficiency	.018	.009	.299	.040

Table 7. Regression Analysis for 6 Month Sleep Efficiency Predicting Positive Affect in the Normal Episode of the SFP

<i>Measure</i>	<i>B</i>	<i>Std. Error</i>	β	<i>P-value</i>
Constant	2.017	.730		.008
Maternal Years of School	.022	.017	.169	.195
Infant Sex	.037	.079	.063	.646
6 Month Efficiency	-.025	.009	-.384	.007

Table 8. Regression Analysis for 6 Month Amount of Sleep Predicting Positive Affect in the Still-Face Episode of the SFP

<i>Measure</i>	<i>B</i>	<i>Std. Error</i>	β	<i>P-value</i>
Constant	.453	.165		.008
Maternal Years of School	-.006	.007	-.112	.413
Infant Sex	-.015	.032	-.064	.648
6 Month Amount of Sleep	-.001	.000	-.268	.060

D. (2012). Preschoolers' daytime respiratory sinus arrhythmia and nighttime sleep. *Physiology & Behavior*, 107(3), 414–417. <https://doi.org/10.1016/j.physbeh.2012.07.005>

5. El-Sheikh, M., Erath, S. A., & Bagley, E. A. (2012). Parasympathetic nervous system activity and children's sleep. *Journal of Sleep Research*, 22(3), 282–288. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/jsr.12019/full>

6. El-Sheikh, M., & Buckhalt, J. A. (2005). Vagal regulation and emotional intensity predict children's sleep problems. *Developmental Psychobiology*, 46(4), 307–317. <https://doi.org/10.1002/dev.20066>

7. Fox, N. A. (1989). Psychophysiological correlates of emotional reactivity during the first year of life. *Developmental Psychology*, 25(3), 364–372. doi:10.1037/0012-1649.25.3.364

8. Fracasso, M. P., Porges, S. W., Lamb, M. E., & Rosenberg, A. (1994). Cardiac Activity in Infancy: Reliability and stability of individual differences. *Infant Behavior and Development*, 17(3), 277–284. Retrieved from https://www.researchgate.net/publication/223371596_Cardiac_Activity_in_Infancy_Reliability_and_stability_of_individual_differences

9. Gentzler, A. L., Santucci, A. K., Kovacs, M., & Fox, N. A. (2009). Respiratory Sinus Arrhythmia Reactivity Predicts Emotion Regulation and Depressive Symptoms in At-risk and Control Children. *Biological Psychology*, 82(2), 156–163. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2848485/>

10. Graziano, P. A., Calkins, S. D., Keane, S. P., & O'Brien, M. (2011). Cardiovascular Regulation Profile Predicts Developmental Trajectory of BMI and Pediatric Obesity. *Obesity*, 19(9), 1818–1825. <https://doi.org/10.1038/oby.2011.98>

11. Graziano, P., & Derefinco, K. (2013). Cardiac vagal control and children's adaptive functioning: a meta-analysis. *Biological Psychology*, 94(1), 22–37. <https://doi.org/10.1016/j.biopsycho.2013.04.011>

12. Hinnant, J. B., Elmore-Staton, L., & El-Sheikh, M. (2011). Developmental trajectories of respiratory sinus arrhythmia and preejection period in middle childhood. *Developmental Psychobiology*, 53(1), 59–68. <https://doi.org/10.1002/dev.20487>

13. King, B. H., Baxter, L., Stuber, M., & Fish, B. (1987). Therapeutic Sleep Deprivation for Depression in Children. *Journal of the American Academy of Child & Adolescent Psychiatry*, 26(6), 928–31. Retrieved from https://www.researchgate.net/publication/19727752_Therapeutic_Sleep_Deprivation_for_Depression_in_Children

14. Lichstein, K. L., Durrence, H. H., Riedel, B. W., Taylor, D. J., & Bush, A. J. (2004). An Archive of the Sleep of African Americans. *Epidemiology of Sleep: Age, Gender, and Ethnicity* (pp. 177–202). New Jersey: Lawrence Erlbaum Associates, Inc. doi:10.4324/9781410610850_er, and Ethnicity (pp. 177–202). New York: Psychology Press. doi:10.4324/9781410610850

15. Moore, G. A., & Calkins, S. D. (2004). Infants' Vagal Regulation in the Still-Face Paradigm Is Related to Dyadic Coordination of Mother–Infant Interaction. Retrieved from <http://www.apa.org/journals/dev/>

16. Naylor, M. W., King, C. A., Kathleen, A., Lindsay, B. A., Evans, T., Armelagos, J., Shain, B. N., et al. (1993). Sleep Deprivation in Depressed Adolescents and Psychiatric Controls. *Journal of the American Academy of Child & Adolescent Psychiatry*, 32(4), 753–759. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0890856709648644>

17. Pilcher, J. J., & Huffcutt, A. I. (1996). Effects of sleep deprivation on performance: a meta-analysis. *Sleep*, 19(4), 318–326. Retrieved from https://www.researchgate.net/publication/14425620_Pilcher_JJ_Huffcutt_AI_Effects_of_sleep_deprivation_on_performance_a_meta-analysis_Sleep_19_318-326

18. Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, 74(2), 116–43. <https://doi.org/10.1016/j.biopsycho.2006.06.009>

Footnotes

1. This project was made possible (in part) by support from the Office for Undergraduate Research at UNC-Chapel Hill.

19. Porges, S. W. (1985). Method and apparatus for evaluating rhythmic oscillations in a periodic physiological response system (U.S. Patent No. 4,510,944). Washington, DC: U.S. Patent Office
20. Porges, S. W. (1995). Orienting in a defensive world: mammalian modifications of our evolutionary heritage. *A Polyvagal Theory*. *Psychophysiology*, 32, 301–318. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8986.1995.tb01213.x/epdf>
21. Propper, C., Mills-Koonce, W. R., Halpern, C. T., Hill-Soderlund, A. L., Carbone, M. A., Moore,
22. G. A., ... Cox, M.. (2008). Gene - Environment Contributions to the Development of Infant Vagal Reactivity: The Interaction of Dopamine and Maternal Sensitivity. *Child Development*, 79(5), 1377–1394. Retrieved from <http://www.jstor.org/stable/27563558>
23. Sadeh, A. (2007). Consequences of Sleep Loss or Sleep Disruption in Children. *Sleep Medicine Clinics*, 2(3), 513–520. Retrieved from https://www.researchgate.net/profile/Avi_Sadeh/publication/228935534_Consequences_of_Sleep_Loss_or_Sleep_Disruption_in_Children/links/56b868fe08ae44bb330cef03.pdf
24. Smaldone, A., Honig, J., & Byrne, M. W. (2007). Sleepless in America: Inadequate Sleep and Relationships to Health and Well-being of Our Nation's Children. *Pediatrics*, 119(1), S29– 37. Retrieved from https://www.researchgate.net/publication/6531243_Sleepless_in_America_Inadequate_Sleep_and_Relationships_to_Health_and_Well-being_of_Our_Nation's_Children
25. So, K., Buckley, P., Adamson, T. M., & Horne, R. S. C. (2005). Actigraphy Correctly Predicts Sleep Behavior in Infants Who Are Younger than Six Months, When Compared with Polysomnography. *Pediatric Research*, 58, 761–765. Retrieved from <http://www.nature.com/pr/journal/v58/n4/full/pr2005737a.html>
26. Wolfson, A. R., & Carskadon, M. A. (1998). Sleep Schedules and Daytime Functioning in Adolescents. *Child Development*, 69(4), 875–87. Retrieved from https://www.researchgate.net/publication/13516634_Sleep_Schedules_and_Daytime_Functioning_in_Adolescents



Archita Chandra is senior from Cary, NC, double majoring in Psychology and Anthropology with a minor in Neuroscience. Her current thesis is based on how infant physiological reactivity interacts with regulatory mechanisms to predict future sleep quality and emotional reactivity to stressful scenarios. She became interested in research in developmental psychology from her child development course in her sophomore year. Through instructors and mentors in the Psychology department, she found volunteering opportunities at the Propper Lab in the Center for Developmental Science and ended up loving the research that was being conducted as part of the NAPS study at the lab regarding the different factors affecting infant sleep quality. She completed an independent research course and conducted her own research project through a SURF grant with the Propper Lab, which culminated in this current thesis.

Humanities

61 - 67

Rethinking Italian Literature Towards Inclusion
by Julie Canziani '17

Faculty Advisor: Dr. Marisa Escobar, Assistant
Professor, UNC Department of Romance Studies

In her senior honors thesis, Julie analyzes non-native Italian writers' contributions to Italian literature. She focuses on the use of the word "migrant", to separate non-native Italian writers from native Italian writers, and she advocates for a more expansive definition of what counts as Italian literature. Her conclusions suggest that the increasing acceptance of migrant literature in Italy reflects a step towards a more general integration of migrant populations into Italian society.

68 - 73

A Taste of Power: The Rhetorical Poetry of Elaine Brown

by Cameron Jernigan '18

Faculty Advisor: Jonathan Foland, Graduate
Student, UNC Department of Communications

Jernigan examines the Black Power movement of the 1960s and 1970s in his manuscript. He explores this topic specifically by analyzing the 1992 memoir of former Black Panther Chairwoman, Elaine Brown. His findings propose without the development of intersectional Black nationalist feminist consciousness in the 60's and 70's there would have been many fewer strong, Black feminist leaders today.

Rethinking Italian Literature to Inclusion

by Julie Canziani

This essay explores the impacts that societal labeling and word usage have on the acceptance of migrant literature in Italy. It analyzes the genre of migrant literature through the critical lens of postcolonial literature, i.e. literature written by people whose countries of origin were subject to European colonialism. The focus is on how migrant-authored works are categorized and how they are systematically separated from the larger realm of “native Italian” literature due to negative Italian stereotypes surrounding migrants. These stereotypes impacted migrant authors through biased translations of their works into Italian and through condescending introductions by “native” Italians that keep migrant voices from being fully heard. The present essay specifically describes the contributions of migrant authors Salah Methnani, Amara Lakhous, and Igiaba Scego and shows how their works are opening the doors of Italian literature in order to make space for subsequent migrant authors. I will explore how migrant authors’ efforts in Italy are transforming the dialogue of Italian literary critics by moving literary conversations towards an extra-European focus. The conclusions drawn suggest that the increasing acceptance of migrant literature in Italy reflects a step towards a more general integration of migrant populations into Italian society.

Keywords: Migrant, literature, postcolonialism, Italy, integration

“Le parole vanno usate con cura,
vanno soppesate.”
- Igiaba Scego

*Words need to be used with care, they carry
much weight.¹*

Introduction

Italian literary critics have classified literary pieces written by authors with foreign origins in countless ways. Even though these so-called *stranieri* have been publishing works at increasing rates in Italy, their literature has been continuously confined to categories such as minor/minority literature, Italophone texts, new Italian literature, extra-European commentary, multicultural literature, and even African literature.² It is evident that critics are determined to establish a clear separation between pieces authored by people with foreign origins and those written by so-called native Italians. Although a separation from the broader category of Italian literature could bring attention to the important conversations that these new voices share in their publications, it has also served to confine this literature to a lower degree of recognition and prevent the stories from being heard. Migrant works describe

struggles with integrating into Italian society and show a desire from migrants to be recognized as equals to Italian citizens. The inconsistent labeling of this literature shows how word-choice, among other factors, impedes efforts at integration into a new country.

I will use the term migrant literature in this essay to refer to works by non-native Italians, in order to separate them from other Italian works and bring attention to their neglect. My intention is not to further separate the works of migrants from the scope of Italian literature, as the previously mentioned classifications have served to do, but rather to recognize this group of authors and bring them deserved respect. I will use the term migrant in order to describe those who have either migrated to Italy or who have ancestors that have migrated there. Although not all authors who are placed in the category of migrant literature have migrated themselves, their discussions of migration-related subjects justify their placement in this category (Coppola 122). The term “literature” will be used as opposed to migrant “commentary” in order to imply simply a “written text that envisages a readership” (Burns 9). The use of the word “commentary” confines the migrant literature to a social function of commenting on existing Italian literature or on Italian society. “Commentary” does

not leave space for migrant works to pose an original voice separate from the pre-existing Italian literature. "Literature," on the other hand, insists that migrant writers have equal opportunity to native Italians in adding to Italian culture.

In the past, migrant literature was consistently overshadowed by native Italian literature due to its late introduction into Italian society, its lack of similarity to existing Italian literature, and its restriction due to prejudiced processes of publication. Migrant literature emerged in the 1990s as more migrants started to enter Italy from Northern Africa and Eastern Europe.³ Unlike other European imperial states, Italy had a short colonial history and only received a small number of migrants from its former colonies (Parati, *Mediterranean Crossroads* 16). As a result, many of the first migrants to Italy came from former colonies of other European countries. In particular, many early migrants to Italy came from former French colonies, leaving a Francophone impression on the migrant literature produced in Italy (Parati, *Mediterranean Crossroads* 15).⁴ Partially because of the differences between migrant literature and standard Italian literature, migrants' literary works were integrated slowly into Italian culture (Parati, *Mediterranean Crossroads* 16, 17). To counterbalance the perceived foreignness of the literature, the first migrant works were primarily co-authored, featuring translations by Italian writers or heavy editing from Italian publishers (Bond 14). In the 1990s, migrant texts often included introductions by Italian writers that served to dominate the migrant-written texts (McGuire 7). These practices strictly limited the voices of migrant writers in Italy during this period. Further, Italian publishing houses valued early migrant publications solely for their exoticism, instead of their literary value (Bond 15; Burns 5). Perceiving migrant literature in this manner shows a disconnect between the migrants' intentions for their literature, in being treated like regular Italian authors, and the alienating reception of migrant literature by Italian society. In order for migrants to actually be granted a space in the world of Italian literature, their work must be accepted as such, pieces of literature.

In recent decades, migrant writers have been fighting to escape from the demeaning impacts of the "migrant" label in how it restricts them from entering Italian literature. Migrant writers Amara Lakhous and Igiaba Scego represent two authors on opposite sides of the "migrant" label. Lakhous migrated directly from Algeria to Italy at the age of twenty-five, whereas Scego was born in Italy, but her family migrated to Italy from Somalia before she was born. Both authors show a desire to abandon the migrant stereotype in the realm of literature. As Valerie McGuire explains, Lakhous makes strong efforts to enter the Italian literary world with his novel, *Scontro di civiltà per un ascensore a Piazza Vittorio*, which was introduced to Italy in 2006. McGuire explains that "Lakhous subverts

the migrant writer label while positioning himself as an eminently 'Italian' author" (2). With his attention to accuracy in representing Italian culture and his rejection of the autobiographical platform that many migrant writers to Italy adopted before him, Lakhous separates himself from the stereotype of migrant literature and becomes recognized as "Italian" in his efforts. Scego also works to become included in the realm of Italian literature by making clear her unhappiness with the various terminology used to describe her and other migrants:

An expression that bothers me is 'new Italians'. I don't think of us as new Italians, I think of us as Italians, and that's it. The same with the term 'second generation'... I don't like when they describe me as a 'second generation immigrant' because I'm not an immigrant. If you're born here, where does the immigration part come in?... Sometimes in the newspaper, I read that I've been described as an 'African writer' or a 'second generation writer', but never just a writer.⁵

Scego's words show her desire to be addressed as a natural part of Italian society and to be appreciated just like all other Italian writers. Scego and Lakhous are two among many migrants who have been denied proper attention in the world of Italian literature.

Italian literary critic Armando Gnisci has tried to bring attention to migrant writers' efforts, like those of Lakhous and Scego, as they work to be accepted into Italian literature. He has done this by working to convince Italian citizens of the necessity to expand the label. In his contributions to the book *Thinking European Worlds: We, the Europeans: Italian Essays on Post-Colonialism*, he argues that confining Italian literature to texts written by what society believes to be "real" Italian writers was limiting and would make the art extinct. He writes:

We will realize that the corpus of our literature is best seen as a plural body, composed of authors in dialects, writers in exile, and foreigners writing in second languages and translated from other languages... the confines of national literature are not barricades, blockades, and security gates. The confines should be seen, on the contrary, as permeable areas of transit open on many levels and in every sense. (Gnisci and Rusnak 63, 64).

With the expansion of the field of Italian literature, writers like Lakhous and Scego earn the level of respect that "native" Italians receive in regards to their literature. Gnisci strengthens his argument by encouraging Italian citizens to realize that there are fewer differences between migrants and themselves (Gnisci and Rusnak 66). By equating migrants and traditional Italians, negative connotations of the word "migrant" begin to disappear within Italian society. This equity is far from being realized in Italy; however, in this essay, I will explore some of the steps that Italy has taken towards achieving it.

In this chapter, I will examine the gradual entrance of migrant literature into Italian society and analyze the progression from highly edited migrant texts to more individually produced works. Specifically, I will analyze migrant authors under the subcategory of “postcolonialpost-colonial writers,” those who migrate from ex-European colonies into Italy. These migrants need not necessarily come from the ex-Italian colonies of Eritrea, Albania, Somalia, or Ethiopia to be considered part of the postcolonialpost-colonial category (Coppola 122). Under this category, I will discuss migrant writers: Salah Methnani, from the ex-French colony of Tunisia; Amara Lakhous, from the ex-French colony of Algeria; and Igiaba Scego, a second-generation migrant whose parents migrated from the ex-Italian colony of Somalia. I will attempt to show that migrant literature adds an outside perspective to Italian literature that expands European perceptions of migrants that reside in their country, and that also expand Italians’ perceptions of themselves and their role in keeping migrants outside of the field of “Italian literature.”

Emergence of Migrant Literature

Migrant literature entered Italian society in the year 1990 as a product of two major events (Di Maio 91). The first event was the enactment of the Martelli Law in February of 1990 (Di Maio 91). This was the first law in Italy to address migration, and it guaranteed rights for non-European migrants to be granted asylum, along with granting better rights for foreign workers (Veugelers 42). This law brought about greater political visibility for migrants in the nation, which brought attention to their literature as well (Di Maio 91). The second event was the murder of South African migrant Jerry Essan Masslo on August 25, 1989, near Naples, Italy (Veugelers 42). The event was broadcast all over Italy and brought attention to the threatening living conditions of migrants in the nation.

Migrant writers gained more freedom with their publications in the second half of the 1990s. Migrants began to publish pieces directly in Italian, without the input of Italian translators or restrictive editors. This offered Italian literature a less-filtered migrant perspective and increased multiculturalism in the publications as hints of migrants’ mother languages began to emerge among the Italian words. According to scholar Jennifer Burns, publishing in Italian emphasizes the intentionality of migrants’ chosen audience members. In her *Migrant Imaginaries: Figures in Italian Migration Literature*, she explains, “to express oneself as a voice from elsewhere in the language and in the cultural space of Italy is itself a bid to be recognized” (Burns 5). In learning Italian, migrants are able to set up a foundation for discussion with Italian citizens in order to define who they are, how they want to be perceived, and how they perceive Italians. As early migrant writer,

Saidou Moussa Ba, explains,

The desire to write was born because [migrants] were essentially unknown [in Italy]. What to do to make ourselves known? If the immigrant becomes aware of himself, he can represent himself so that the other, whom the Italian has heard discussed only in generic terms, can define himself. In their books, immigrants want to represent themselves and also the “other”: we are like this, but you are like this too. (Parati, “Intervista a Saidou Moussa Ba”, 104-107)

In the proceeding sections I will show how literature by various migrant writers in Italy serves to form a new definition of “migrants” and “Italians,” therefore making themselves known in the Italian literary world.

Postcolonial Literature

I have chosen to specifically categorize the following migrant literature under the post-colonial subcategory, thus bringing attention to the impacts that colonialism had on European colonies.⁶ In this section, I will discuss migrant writers Salah Methnani, Amara Lakhous, and Igiaba Scego who migrated to Italy and have roots in Tunisia, Albania, and Somalia, respectively. I include migrant writers of ex-Italian colonies, but also writers of other former European colonies, as both groups provide pertinent discussion on migration as first-hand observers of the impacts of colonialism. This, in turn, similarly shapes their treatment once they arrive in Italy.

Daniela Merolla and Sandra Ponzanesi advance the question of whether using the term “migrant” recreates a colonial divide in the destination countries of migrants (4). However, categorizing migrant literature under the grouping of “post-colonialism” also functions to bring attention to the colonial heritage of migrants’ countries of origin in order to make sure that they are not forgotten by European nations. In her autobiographical novel, *La mia casa è dove sono*, Igiaba Scego describes the lack of Italy’s awareness regarding its own colonial legacy as “il vuoto” (“The emptiness”).⁷ The version of the novel published by Loescher Editore combats this lack of awareness by including a section at the end of the novel entitled “Intrecci di lettura” (“Reading Plots”). This section describes Italian imperialism in Somalia, the country from which Scego’s parents migrate, and describes the ways in which Italy left an impression on the ex-colony (Scego, *La mia casa* 165).

Focusing on the stories of migrants who have experienced colonialism places a sense of responsibility on the shoulders of Italian citizens; a responsibility to recognize their colonial past and work to reconcile the fact that their colonial presence significantly impacted colonized nations. In some ways, colonialism may have even led to the migration patterns that are bringing migrants to Italy

today. PostcolonialPost-colonial migrant literature, if read carefully, can serve to reveal these truths.

Salah Methnani

Tunisian migrant Salah Methnani was one of the first migrant writers to be published in Italy. His autobiographical narrative, *Immigrato*, began as a news article and was later developed and published as a novel in 1990 in co-authorship with Mario Fortunato who provided the translation and introduction (IV). Inserting an introduction by Fortunato, an Italian native, prefaces the work with an Italian voice that partially detracts from Methnani's succeeding perspective. Further, the Italian publisher, Giulio Einaudi, assigned the title *Immigrato*, limiting the potential for creative contribution by Methnani.

Fortunato's introduction describes his first impressions of Methnani and demonstrates stereotypes that existed in the late 1980s towards African migrants by saying, "Aveva studiato lingue straniere, teneva una laurea in tasca, si interessava alla letteratura. Era vivace, sensibile. Niente che lo accomunasse con lo stereotipo del nordafricano immigrato" ("He had studied foreign languages, had received his degree, was interested in literature. He was lively, sensible. He was nothing that I associated with the stereotype of a north African migrant") (III). This comment sets up the novel in a way that separates Methnani from the majority of African migrants in Italy, implying that, in the eyes of Italians, other North African migrants do not share his admirable qualities.

In *Immigrato*, Methnani's descriptions of other migrants that he met in Italy, might partially confirm Italian stereotypes as he discusses practices of stealing and prostitution that migrants had resorted to in order to survive in Italian society. On one hand, painting this picture of migrants serves to show Italian citizens the extent of migrants' struggles in Italy. On the other hand, these negative depictions of migrants did not help to dispel established stereotypes towards migrants in the 1990s. Methnani, however, also depicted his efforts at integrating into Italian society with his use of the Italian language. As a child, he and his father practiced Italian together in Tunisia, and it was a hobby that established a strong bond between them. When Methnani moved to Italy, his attempts at using the Italian he had practiced with his father were not appreciated by Italian society (Di Maio 97). As Alessandra di Maio explains, Methnani "soon realizes that his knowledge of standard Italian is an obstacle rather than an advantage, because it disorients those who hear it, frequently causing distrust, especially among the established who, symbolically, experience the foreigner as a potential invader and a threat to the existing order" (97). This reception of spoken Italian by migrants is similar to the reception of migrant literature in Italy- less accepted only because the migrant authors bare differences to the native Italian authors who precede them. After having his spoken Italian rejected, Methnani resorted to learning what he described as "migrant talk," that African migrants in Italy used to commu-

nicate with one another. This example demonstrates how a rejection of migrant efforts at integration can fulfill a stereotype. However, even though Methnani changed his ways to adopt the stereotypical migrant speech while talking, he breaks the bounds of the stereotype by having his autobiographical novel published.

In the introduction to *Immigrato*, Fortunato does acknowledge the significance of Methnani's story in Italian society as he says that it "rappresenta uno specchio per guardare dentro alla nostra italianità" ("represents a mirror with which we can look inwards at our Italian-ness") (IX). Therefore, Fortunato suggests that Italians need to reassess their relationships with migrants and potentially be more open to who they accept as being Italian, including who they welcome into Italian literature. Many universities adopted *Immigrato* as the first example of immigration literature, indicating a beginning to the diffusion of migrant literature in the arenas of Italian literature (Fortunato VII).

Amara Lakhous

Amara Lakhous was born in Algeria in 1970 and moved to Italy at the age of 25. His attention to detail and accuracy regarding Italian culture, including references to different regional dialects and mention of various Italian icons, shows his determination to be recognized as an Italian writer, despite his foreign origins. With his book *Scontro di civiltà per un ascensore a Piazza Vittorio*, published in Italian in 2006, Lakhous rejects the subordination imposed on other migrant writers who allow Italians to translate their texts. He originally published the text in his native language, Arabic, but in order to make the work accessible to Italian audiences, he rewrote the piece in Italian and emphasized the scenes he considered to be more necessary for Italians to grasp.

Lakhous also strays from other migrant authors as he avoids writing an autobiographical piece, such as those of Salah Methnani and Igiaba Scego.[8] With *Scontro di civiltà per un ascensore a Piazza Vittorio*, Lakhous creates a giallo, or a crime investigation piece, that demonstrates that migrants can contribute to Italian literature with genres other than autobiographies, which many migrant writers had limited themselves to before (McGuire 2).

Lakhous convinces Italian audiences of his authenticity with his realistic depictions of Italians from various regions of the country. His widespread understanding of Italian culture reflects that of Amedeo, the migrant protagonist of *Scontro di civiltà per un ascensore a Piazza Vittorio*, who is thought to be Italian due to his strong hold on the Italian language and his extensive familiarity with the city of Rome. In the various chapters of the novel, the characters discuss their appreciation for Amedeo, while often denying the fact that he is a migrant from Algeria. With these descriptions, Lakhous explores the idea that solely the label of "migrant" changes how one is perceived in Italian society. Without knowing one's origin, there could be little to really

distinguish a migrant from a native Italian. This contributes to the idea that the notion that migrants pose threats to Italian people is socially constructed.

The way in which Lakhous introduces characters from all parts of Italy and Europe, shows that differences do not exist just between Italians and migrants, but among Italians themselves. Lakhous's character Antonio Marini represents an Italian from the north. His character distinguishes himself from southern Italians by saying the disorganization that exists in the south would never exist in the north. He compares the way that the south operates to that of a third world country (Lakhous 73). This puts into question the homogeneity of Italians and makes us ask, again, why can't migrants be more easily accepted into a society that already encompasses so many different ways of life? On a wider scale, by introducing a character from Amsterdam into his novel, Lakhous shows that Europeans aren't all so similar to each other either, and therefore, should be more tolerant towards accepting migrants and their diversity.

Lakhous uses his characters in *Scontro di civiltà per un ascensore a Piazza Vittorio* to demonstrate issues in discourses between migrants and Italians that keep them from understanding one another. His strongest examples come from his Neapolitan character Benedetta Esposito, the custodian of the elevator in question, who has much to say about the migrants who pass through there. In one scene she discusses an Iranian migrant Parviz and says,

Quello che aumenta i miei sospetti è il fatto che non conosce per niente il suo paese. Ha provato più volte a convincermi che viene da un paese che non è l'Albania. Non è l'unico a disconoscere il paese di origine per evitare l'espulsione immediata, ah eh! La Filipina Maria Cristina mi dice sempre che non viene dalle Filippine, ma da un altro paese di cui non ricordo il nome. (Lakhous 35)

What raises my suspicions the most is the fact that he doesn't know anything about his country. He has tried multiple times to convince me that he comes from a country that isn't Albania. But he is not the only one to deny a relationship to his country of origin in order to avoid immediate expulsion, ah eh! The Filipina Maria Cristina tells me all the time that she doesn't come from the Philippines, but a different country whose name I can't remember.

Benedetta's certainty that Parviz comes from one of the major countries of origin of migrants to Italy, and the fact that she cannot remember the country that Maria Cristina said she was actually from, shows a mental grouping of migrants that dehumanizes them and causes them to be taken less seriously in Italian society. These interactions demonstrate a lack of attention given to the words of migrants and show that, even when migrants are given voices—whether in literature or daily life—sometimes

they go unheard. Recognizing the situation of migrants in Italy, Lakhous works to escape the stereotypes surrounding the word "migrant" by attempting to enter into Italian literature.

Igiaba Scego

Igiaba Scego was born in Rome to Somali parents and still lives there today. Scego, like Lakhous, wants to be considered in a neutral way, as simply a "writer" in Italian society. She has instead been labeled an "African writer," a person "of color," and a "new Italian" (Scego, *La mia casa* 196). Describing Scego as an African writer ignores the fact that she was born and raised in Italy. This means she speaks the Italian language and understands Italian culture just as well as Italians whose parents did not migrate from a different country. The difference between Scego and most native Italians, however, is her skin color. In the section *Voci* at the end of her autobiographical novel, *La mia casa è dove sono*, Scego explains that she does not appreciate being called a person "of color." She believes that this terminology implies that there is a right color and a wrong color to be. Instead, she said she prefers the term "nera." "Nera" ("black") describes her skin color and seems like a more accurate description to her than "of color." Finally, Scego expresses her disapproval for the labeling of migrants as "new Italians." She believes that adding the "new" again provides a distinction between migrants and Italians. Following these statements, it is clear to see that Scego believes one of the best solutions to migrant discrimination in Italy is to stop labelling them in ways to accentuate their status as "the other." If migrants of second generation were just considered Italian and if migrant writers were just considered writers, the ways in which Italian citizens thought about these people would become more inclusive.

In *Faduma & Barni* published in 2003, Scego illustrates the impacts of stereotypes imposed on migrants in Italy. The difficulty that migrants encounter when using Italian in Italy, like that presented in Methnani's novel, is again apparent in Scego's short story as she writes,

In hearing people say: 'You blacks don't know Italian!' Barni had ended up believing it. She abandoned Dante, Ariosto, and Leopardi and in their place, she adopted scandalously ungrammatical verbs. Her language became confused and approximate. And she ended up becoming that stereotype of an immigrant woman that society (or better, the media) wanted to see in her. (Scego, "Faduma & Barni" 171)

This fictional anecdote demonstrates the power of behind stereotypes in restricting someone to a specific place in society. With this story, Scego exemplifies a migrant woman who attempts to integrate into Italian society by adopting Italian culture, but who is rejected and resorts to falling back into the stereotype that simplifies migrants.

The migrant writers that I have discussed in this section do not succumb to the harmful effects of stereo-

types in Italy, but work to overcome them by continuing to produce works in Italian and by using the language to be understood by Italians. In her autobiographical novel *La mia casa è dove sono*, published in 2010, Scego writes to level the positions of Italians and migrants by showing positive and negative interactions with both groups. One of her strongest examples comes from her early years in elementary school. She explains feeling like an outsider in classrooms full of mainly Italian children.

Oggi alcune mamme si lamentano della presenza di bambini di origine straniera nelle scuole... Non voglio contaminare la loro prole. Ma se qualcuno le chiama razziste, loro negano. 'Non è razzismo. È solo che questi bambini limitano la produttività della scuola. Noi vogliamo il meglio per i nostri figli, non vogliamo farli diventare zulu.' (152)

Today, some moms complain about the presence of children with foreign origins in the schools... They don't want them to contaminate their offspring. But if someone calls them racist, they negate it. 'It's not racism. It's just that these children limit the productivity of the school. We want the best for our children, we don't want to make them become Zulu.'

Facing these attitudes towards migrants, Scego was discouraged to speak up in class, which reinforced negative perceptions about her capabilities. Scego goes on to explain, however, that it was also an Italian who saved her from these negative stereotypes. Her teacher worked with her to allow her to speak about things she was familiar with, including stories from Somalia. With this encouragement, Scego began to flourish. "E non scherzo quando dico che la mia maestra elementare, quella signora dai vaporosi capelli bianchi, mi ha salvato la vita" ("And I'm not kidding when I say that my elementary teacher, that woman with the wispy white hair, she saved my life") (Scego, *La mia casa* 157). With this story, Scego demonstrates that what is necessary to better the situation for migrants is for Italians to understand and to accept the stories they have to share.

Conclusion

Salah Methnani, Amara Lakhous and Igiaba Scego demonstrate the entrance of migrant writers into Italian literature. Methnani, as one of the first migrant writers to be published in Italy, introduces a migrant perspective into the realm of Italian literature. Methnani's work has been followed by Lakhous, who, by demonstrating a great understanding of Italian culture, minimizes differences between migrants and Italians and expands the credibility of migrant work, while also establishing a space for equality. And finally Scego, by depicting instances of productive collaboration with native Italians, demonstrates that good will come from peaceful interaction between both groups. This encourages the idea that Italian society will be bettered by establishing

relationships between native Italians and the migrants who live in Italy.

By incorporating migrant literature into Italian literature, integration of migrant writers into Italian society, as well as the migrants they represent in their writing, will occur. Discriminatory labeling that separates migrant literature from Italian literature, including the labeling of the genre and the labeling of the authors, plays a large role in causing migrant literature to be less well-received than works by native Italians. This is due to the stereotypes associated with migrants that exist in Italy today. These stereotypes persist because of the limited interaction between migrants and native Italians over the past few decades. Novels written by migrants, however, present an opportunity for this interaction to begin. When literary pieces by migrants are taken up by Italian literary critics, migrant authors' talents become more visible. And once migrants' voices are made welcome in the medium of literature, it is possible that Italian citizens will begin to accept integration in other areas of society as well.

Acknowledgements

I would like to thank the many people who have helped me in writing this chapter of my honors thesis project. I would like to thank my thesis advisor, Marisa Escolar, who inspired my interest in migrant literature within Italy with her vast knowledge on the subject, and who read and reviewed, not only this chapter, but my whole project countless times with continuous enthusiasm. I would also like to thank Amy Chambless for encouraging me and assisting me in publishing my work, and for always providing me with new opportunities to embrace my love for Italian. Finally, I would like to thank my many peers who offered to read my work in order to provide feedback and who took interest in discussing the subject of migration literature in Italy with me, further inspiring my research path.

Works Cited

- Bond, Emma, et al. "Introduction." *Destination Italy: Representing Migration in Contemporary Media and Narrative*, edited by Emma Bond, Guido Bonsaver, and Federico Faloppa, Peter Lang, 2015, pp. 1-27.
- Burns, Jennifer. *Migrant Imaginaries: Figures in Italian Migration Literature*. Peter Lang, 2013.
- Coppola, Manuela. "'Rented spaces': Italian postcolonial literature." *Social Identities*, vol. 17, no. 1, 2011, pp. 121-135.
- de Haas, Hein. "The Myth of Invasion: the inconvenient realities of African migration to Europe." *Third World Quarterly*, vol. 29, no. 7, 2008, pp. 1305-1322.
- Di Maio, Alessandra. "Salah Methnani's *Immigrato*: Portrait of a Migrant as a Young Man." *Expressions Maghrébines*, vol. 11, no. 2, 2012, pp. 89-106.
- Fortunato, Mario, and Salah Methnani. *Immigrato*. Tascabili Bompiani, 2006.
- Gnisci, Armando, and Matthew F. Rusnak. *Thinking European*

Worlds: We, The Europeans: Italian Essays on Postcolonialism. The Davies Group, Publishers, 2014.

King, Russell and Mai, Nicola. *Out of Albania: From crisis migration to social inclusion in Italy*. Berghahn Books, 2008.

Lakhous, Amara. *Scontro di civiltà per un ascensore a Piazza Vittorio*. Edizione e/o, 2006.

McGuire, Valerie. "Crimes of Diction: Language and National Belonging in the Fiction of Amara Lakhous." *Journal of Romance Studies*, vol. 15, no. 2, 2015, pp. 1-21.

Merolla, Daniela, and Sandra Ponzanesi. *Migrant Cartographies: New Culture and Literary Spaces in Post-Colonial Europe*. Lexington Books, 2005.

Pampinella, Margherita. "From marginality to integration: Appropriation of space through sociolinguistic competence in Laila Wadia's *Amiche per la pelle*." *SAGE Publications*, vol. 49, no. 1, 2015, pp. 74-91.

Parati, Graziella. "Intervista a Saidou Moussa Ba", *Studi*

d'Italianistica nell'Africa Australe/*Italian Studies in Southern Africa*, vol. 8, no. 2, 1995, pp. 104-107.

Parati, Graziella. *Mediterranean Crossroads: Migration Literature in Italy*. Fairleigh Dickinson UP, 1999.

Scego, Igiaba. "Faduma & Barni (April, 2003)." *Multicultural Literature in Contemporary Italy*, edited by Graziella Parati and Marie Orton, Fairleigh Dickinson University Press, 2007, pp. 164-174.

Scego, Igiaba. *La mia casa è dove sono*. Loescher, 2012.

Veugelers, John W.P. "Recent Immigration Politics in Italy: A Short Story." *West European Politics*, vol. 17, no. 2, 1994, pp. 33-49.

Footnotes

1. All translations included in this essay (found directly beneath/beside original texts) are my own, unless otherwise stated.
2. For more on minor/minority literature and Italophone texts see Parati's *Mediterranean Crossroads* pp. 16, 18; For more on extra-European commentary see Gnisci and Rusnak's *Thinking European Worlds* pp. 64; For more on multi-cultural literature see Bond's *Destination Italy* pp. 16; Igiaba Scego discusses references to her writing as "African literature" in her autobiographical novel *La mia casa è dove sono*, pp. 197.
3. Migration from the Maghreb to Italy greatly increased in the late 1980s as a result of increasing demand for low-skilled workers. For more information, reference de Haas's "The Myth of Invasion" pp. 1307. Outside of Africa, migrants fled the ex-Italian colony of Albania and landed in Italy in March 1991. For more information, reference King's *Out of Albania* pp. 1.
4. Later on in this essay, I will discuss migrant writers Salah Methnani and Amara Lakhous, who migrated to Italy from ex-French colonies.
5. This translation is my own. The original text can be found in Igiaba Scego's *La mia casa è dove sono* pp. 197.
6. As stated earlier, post-colonial literature in Italy most immediately refers to migrant writers who descend from former Italian colonies, including Somalia, Albania, Eritrea, and Ethiopia. However, migrant writers who are included in this category must not necessarily be of direct descent of the former Italian colonies. For more information, refer to Coppola's "Rented spaces: Italian postcolonial literature." pp. 122.
7. I refer to chapter 4, "La stele di Axum," in *La mia casa è dove sono* where Scego describes how the Obelisk of Axum, representing colonialism in Ethiopia, was removed from Piazza di Porta Capena in Rome leaving a "vuoto" that seems full of hate. She states that she hopes the "vuoto" can be transformed into love or at the very least, understanding.
8. The first migrant literature published in Italian society came out in 1990 and was primarily autobiographical. Salah Methnani's *Immigrato* was one of the three autobiographical migrant novels published this year, along with *Io, venditore di elefanti* by Pap Khouma and *Oreste Pivetta* and *Chiamatemi Ali* by Mohamed Bouchane. Igiaba Scego's *La mia casa è dove sono* is another autobiographical novel produced by a migrant in Italy. However, her novel, published in 2010, shows the perspective of a second-generation migrant.



Julie Canziani, a senior at the University of North Carolina at Chapel Hill, is pursuing a double major in Global Studies and Italian, with a minor in Business Journalism. She has collaborated on one prior publication with the City of Bologna's Office of Cooperation and Human Rights: the "Report of the Activities on the Implementation of the ECCAR 10 Point Plan of Action: 2014-2015." Her junior-year study abroad experience in Bologna, Italy inspired her to undertake advanced studies related to immigration issues within Italy. Her honors thesis explores the relationships between migrants to Italy and native Italians; her research additionally focuses on how immigration terminology in Italian society serves to limit the integration of newcomers into Italy. The first chapter presented here focuses on migrant literature in Italy and how it is slow to integrate into the accepted or traditional realm of Italian literature.

A Taste of Power: The Rhetorical Potency of Elaine Brown

by Cameron Jernigan

What roles did women play in developing the Black Power movement of the 1960s and 1970s, and how did these women create a space for Black women to develop an intersectional Black nationalist, feminist consciousness? This paper examines the historical narrative of the Black Power movement as told by Black women. Specifically, I focus on *A Taste of Power*, the 1992 memoir of former Black Panther Party Chairwoman, Elaine Brown. Her memoir serves as one of the few autobiographical accounts of the Black Panther Party from the perspective of a woman, especially that of a high ranking member. Although women like Kathleen Cleaver and Assata Shakur have written memoirs about their time in the movement, few have been in a position as Brown. Being the public face of the largest organization of a movement gives one a unique view of the interworking system of a movement. Brown's memoir challenges the notion that the movement was a wholly male production and that women's roles were largely subservient and subordinate. Borrowing from rhetorical theories of constituted publics, memoir, and public memory, I examine Brown's account of how the movement influenced Black women's intersectional, nationalist, and feminist consciousness. This consciousness has had a lasting impact on many noted Black female thinkers, writers, scholars, and activists of today, including Johnetta Elzie, Jamilah Lemieux, and Dr. Melissa Harris-Perry. Thus, without an historical narrative shift of the Black Power movement from patriarchal to feminist, many of today's Black feminist leaders would not exist.

Keywords: Elaine Brown, Black Panther Party, Black Power, Feminism, Social Movements

Introduction

Much as been said about the Black Power movement and Black women. Specifically, given the belief that the movement was inherently sexist and hyper masculine, how were women involved? What type of roles did they play? Were they even allowed to be involved at all? Many of these questions are asked when people discuss the role of women in Black activism in general, especially movements like the Black Power movement. While it is known that women played an important role in the movement, there is a dearth of literature devoted to their roles, because their voices have been silenced, drawn out, or ignored, which has led many to overlook the role of women in the movement. Although there is knowledge of the involvement of women in the movement, there is very little literature devoted to the personal experiences of women involved. This is primarily due to the voices of women being silenced, drawn

out, or simply not being heard. Because of this, it is easy to overlook or discredit the experiences of women in the movement. Many paint the movement as innately macho and sexist, which further constructs the experiences of women as monolithic and homogenous.

Why a Memoir?

The decision to write a memoir, rather than give a speech or participate in a protest, is an important rhetorical choice for Brown. Specifically, the choice of a memoir, rather than a speech or protest, is important. Author William Zinsser notes, "Memoir is how we try to make sense of who we are, who we once were, and what values and heritage shaped us. If a writer seriously embarks on that quest, readers will be nourished by the journey, bringing along many associations with quests of their own" (6). His statement holds true for Brown. Although the memoir is written predominantly as a political memoir, recounting mainly socio-political moments, it still speaks of Brown

personally. Although each story, each moment, can be linked back to her time as a Panther, the book sheds light on Brown as a person and emphasizes her humanity, something that only a memoir could do. Because of this, the reader is able to connect with the work and better receive it, which is one of the desired rhetorical effects.

However, for Brown, the personal is political. It is still a political memoir in nature, thus the goal is to sell a political agenda. Given the size and scope of a memoir, there is ample room to not only set this agenda, but add nuance and intersections. For Brown, the movement not only focused on Black Power but also feminism and socialism. Not only was Black power a focus, but feminism and socialism as well. The broad goal of the book was to tell her story of her time as a member of the Black Panther Party, a political organization. It is intrinsically political, regardless of her goals.

Because of the many ahistorical narratives of the Black Power movement, Brown's memoir is an essential rhetorical document to explaining the truth about women and their roles within the movement.

What is Black Power?

Before discussing Elaine and the Panthers, we must first outline Black power itself and the movement. Black power, first and foremost, is the ideology and belief in Black pride, the creation of Black political and cultural institutions, primarily as a means of promoting and fostering Black collective interests and values. Those who believed in this ideology and took action around it, whether alone or within an organization, grew to be known as the Black Power Movement.

The Black Power Movement begins, primarily, with a speech given by then-Student Nonviolent Coordinating Committee (SNCC) chairman Stokely Carmichael in 1966. At a rally after his release, Carmichael would say, "This is the twenty-seventh time I have been arrested--and I ain't going to jail no more! The only way we gonna stop them white men from whuppin' us is to take over. We been saying freedom for six years and we ain't got nuthin'. What we gonna start saying now is Black Power!" (Carmichael & Thelwell 507). The speech, called for Black people to take rights for themselves and take control of their own destiny.

Later that year, SNCC officially changed its political position from "Civil Rights" to "Black Power." They explained their change in ideology and beliefs through a position paper, "The Basis of Black Power" (SNCC). In this paper, they outlined their reasoning for change, through explanation of key concepts, such as Black self-determination. Although this document did not explicitly give life to SNCC's name, it did reestablish who SNCC was. This document was also planting of the seed that would eventually grow into the renaming of SNCC, replacing "Nonviolent" with "National" three years later, in 1969. The document is a defining moment in the later evolution of SNCC. It can be argued that, under the Carmichael administration, a new organization was forming. Although the name change did

not occur until three years later, the fundamental ideology, practices, and beliefs of SNCC changed under this administration, beginning with this document.

Women in The Movement

Although many women held large, important, powerful roles in the movement, by and large, the movement had a very masculine, patriarchal public and internal image and ideology. Tufts University professor Peniel E. Joseph noted this, saying "Carmichael and black-power activists did embrace an aggressive vision of manhood — one centered on black men's ability to deploy authority, punishment, and power. In that, they generally reflected their wider society's blinders about women and politics" (Joseph). The vision of aggressive manhood that Joseph speaks to is further expounded on by Duke professor Mark Anthony Neal in his 2005 book, *New Black Man*. In it, he describes this type of manhood as "well-adjusted, middle-classed, educated, heterosexual black men whose continued investment in a powerful American-style patriarchy (often remixed as Black Nationalism and Afrocentrism) and its offspring homophobia, sexism, and misogyny, represents a significant threat to the stability and sustenance of black families, communities, and relationships" (Neal). While Neal speaks moreso to the Black men that came after the era of Black power, they are simply following in the long lineage of Black men in America that believe in and practice this style of patriarchal masculinity. By and large, it was a long-standing characteristic of Black power. Due to this, the struggles of Black women within the movement were highly common and, sadly, integral parts of the Black female experience of the time and today.

Although the experiences of Black females in the Black Power Movement were marred by mistreatment, many influential figures in the movement cite that mistreatment as a reason for getting involved. In a chapter titled "A Woman's Party" from his book, *We Want Freedom: A Life in the Black Panther Party*, political prisoner and former Panther Mumia Abu-Jamal recounts his experiences around female Panthers during his time in the Party. Afeni Shakur, mother of Tupac Shakur and former Panther, said her reasoning for joining the Panthers was the way in which her Panther friends discussed women (Abu-Jamal). Abu-Jamal, far from a patriarchy or sexism apologist, admits "much of the movement was indeed deeply macho in orientation and treated women in many of these groups in a distinctly secondary and disrespectful fashion" (Abu-Jamal 160). In spite of this, he makes it clear that, in joining the Party, Black women were agents of their own liberation, themselves taking control of their freedom.

Elaine and The Panthers

In spite of her positionality, Elaine Brown, the chairwoman of the Black Panther Party when Huey Newton fled to Cuba due to a murder charge in 1974, was not absolved from the mistreatment many women face within

the movement. In her memoir, she says:

"A woman in the Black Power movement was considered, at best, irrelevant. A woman asserting herself was a pariah. If a black woman assumed a role of leadership, she was said to be eroding black manhood, to be hindering the progress of the black race. She was an enemy of the black people.... I knew I had to muster something mighty to manage the Black Panther Party." (362).

As a woman, her rise in the Party was not easy. She began as a rank and file member of the Party in 1968. She sold party literature, cleaned guns, and performed other tasks, before helping start their first Free Breakfast for Children program in Los Angeles the next year. She also helped start their first Free Busing to Prisons Program and Free Legal Aid Program. She also recorded two albums worth of songs about the Party and the movement.

Brown eventually became the Party's Southern California publication editor, before replacing Eldridge Cleaver as Minister of Information as a member of the Party's Central Committee. At the behest of Party leader Huey P. Newton, she ran unsuccessfully for Oakland City Council in 1973 and 1975. When Newton fled to Cuba in 1974 in the face of a murder charge, he appointed Brown to become Party Chairwoman.

As Chairwoman, Brown focused primarily on electoral politics and community service. In 1977 she managed Lionel Wilson's successful campaign to become Oakland's first Black mayor. She also developed the Panther Liberation School, which was cited as a model school by the state of California. It was also under Brown's leadership that women began serving on the Party's Central Committee. This angered many men and would eventually cause rifts within the party between males and females.

For most of Brown's time in the party, she had an emotional and sexual affair with Newton. In many popular accounts of the Black Power movement, women's roles are diminished to nothing more than wives, girlfriends, and lovers of prominent men (i.e., Kathleen Cleaver, the former wife of Eldridge Cleaver). Especially in the case of lovers, any and all credibility as an activist is negated because of the relationship with a man. Some argue that women in relationships with prominent men only reached the level they did because of said relationship. Brown's decision to showcase this affair is significant, as it shed light to this fallacy and showed the true nature of many of these relationships. Some of the more poignant moments of the memoir describe the sometimes complex relationship between Brown and Newton, as he is both her lover and leader. In one of the final chapters, Brown describes a phone conversation after she finds out that Newton authorized the beating of Regina Davis. Newton reacted with confusion as Brown criticized him for concurring with male leadership and authorizing the attack, recounting "I called Huey. His response was not that of my lover or leader. It was a bland acknowledgement that he had indeed given his authori-

zation for Regina's discipline" (444). She continues, with Huey stating:

"You know, of course, that I know all that," he said finally, softly, thoughtfully. "But what do you want me to do about it? The Brothers came to me. I had to give them something."

"You gave them Regina?"

"Stop it. She took a hard line. She brought that on herself. Stop acting like a child. It doesn't affect you. And you know the deal as much as I do now. I just want to keep motherfuckers out of my face. Yours too for that matter."

"I said nothing." (45)

The exchange blurs the line between lover and leader, and shows that regardless of how high a position she was in, being in a relationship with Newton was not a ticket to win every struggle against sexism and abuse within the party. Because of the blurring between lover and leader, we see that Huey uses the power structures of both relationships to diffuse the dispute. This scene shows how insignificant the value worth and care for Black women within the party truly was at times. It also shows how to be willful is to be the agitator and aggressor. In "Feminist Killjoys (And Other Willful Subjects)," feminist scholar Sara Ahmed writes "However you speak, the one who speaks up as a feminist is usually viewed as 'causing the argument,' as the one who is disturbing the fragility of peace. To be willful is to provide a point of tension. Willfulness is stickiness: it is an accusation that sticks" (Ahmed).

The exchange with Huey also shows how Brown and other women kept the movement going when their lovers were unable to do so. While Newton was in Cuba after facing murder charges, it was Brown who led the party and pulled it out of turmoil. Without Brown, and the many women she appointed to the Central Committee, much of the party's successes would not have happened. Through this, she affirms the fact that Black women were the backbone of the party, and ultimately much of the reason for its political and financial success at the time. This challenges the narrative that women in the Party were not influential and essential to the organization, or at best feminist killjoys that ruined the distinction and strength of the Party. Although this is far from the truth, being a "killjoy" is essential to being a feminist in a predominantly male space. Also in "Feminist Killjoys," Ahmed writes "To be recognized as a feminist is to be assigned to a difficult category and a category of difficulty. You are 'already read' as 'not easy to get along with' when you name yourself as a feminist" (Ahmed).

A Taste of Power

Brown left the Party in 1977. She would later write a memoir about her time in the movement, titled *A Taste of Power: A Black Woman's Story*. As a woman that was in-

volved in almost every facet of what is arguably the largest group of the Black Power movement, Brown's perspective of the movement is undeniably essential to understanding the struggles of Black women in the movement. Many of the common accounts of misogyny during the movement have been repeated by her. Like many components of the movement, the struggles that Black women have faced have largely been left out of the narrative, so having first-hand accounts are necessary, especially from someone with the positionality of Brown.

In addition, the stories of Black women told through the written word have historically been silenced. Quoting scholar Elspeth Probyn, Sidonie Smith notes, "One doesn't have to scratch deeply to find that class, race, and gender have a lot to do with whose experiences are on top"—that is, with whose lives traditionally have gotten written and read, with whose experiences have been seen as "real" (398). Brown's act in writing a memoir is not simply defying the politics of Black activism, but memoirs themselves.

The book, published in 1992, chronicles the life of Brown from her youth in Philadelphia until her unceremonious exit from the Black Panther Party. Similar to other important memoirs from women within the movement (i.e., Angela Davis's *An Autobiography*, Assata Shakur's *Assata*), the work attempts to shed light on how Brown's childhood and early adolescence prepared her for her future work as a political activist. It explicitly, it attempts to explain how her early life equipped her to survive and thrive in the male dominated, male centric system that was the movement. For example, early in the book, Brown discusses how gang life among youth controlled her movements around her neighborhood, stating "It was important to understand the nuances of North Philly gang life. It was critical to one's survival – a concept that was my standing priority" (40). She goes on to say, "Boys' gangs literally controlled life in our various North Philly neighborhoods, and most boys claimed gang membership... There were many rules for girls about how to relate to a gang and its members. One of the most abiding was that girls living in one gang territory did not so much as hold a conversation with a member of another gang" (41). It is clear that Brown's time growing up in North Philadelphia, although mostly spent in fear, prepared her to handle the trials of being a woman in a male dominated field. Brown learned early on that there were certain rules, regardless of justifiability, that had to be obeyed simply to survive. Learning this lesson and putting it into practice was essential to successfully climbing the ranks of the Party.

A key element of *A Taste of Power* is the way in which Brown employs constitutive rhetoric to establish the collective identity of Black women in the movement. Constitutive rhetoric refers to the ability for language or symbols to create a collective identity for a group, or a constituency. In other words, using rhetoric, a group, quite literally, speaks themselves into existence. Through their rhetoric, they transform themselves from a group of people into a unit, or a collective. This is done primarily by laying out

who they are, what they believe in, and what their goals are. There are three basic ideological effects of constitutive rhetoric. First, it has a naming function. There has to be a name. At some point, a naming of the issue at hand will be actualized and realized through some rhetorical mode. Second, the rhetoric is trans-historical, meaning, it will transcend historical bounds and be applicable throughout history. Thirdly, the rhetoric will display and explain the ideology of the group, or the rhetors speaking for the group (Charland). These three pieces do not have to follow in any certain order, but they all are core effects of constitutive rhetoric.

In the case of Brown, she employs constitutive rhetoric by forming the collective identity that is the Black woman in the Black Power movement. Brown's decision to write the memoir is an act of constitutive rhetoric within itself. In telling her story, she tells everyone's story, creating and further explaining the collective condition of Black women in the Black Power movement. Black women in the movement believed in an intersectional, multilayered concept of Black nationalist feminism. They advocated for their race and their sex. This is important, as many Black women at that time pushed back against the idea of mainstream second-wave feminism and were not yet aware of Black feminism and womanism. Even Brown felt this was at one point, stating "I had never thought of myself as a feminist... I had joined the majority of black women in America denouncing feminism. It was an idea reserved for white women, I said, assailing the women's movement, wholesale, as either racist or inconsequential to black people" (367). Much like many other Black women at the time, the idea that a Black woman could or should advocate for their gender to the same degree as their race was far too radical. Although they did not state this, women within the party came to realize the power they had as women and the way in which they could and would exercise that power. As women, their gender was power. As Brown explains it, "Our gender was but another weapon, another tool of the revolution. We also had the task of producing children, progeny of revolution who would carry the flame when we fell, knowing that generations after us would prevail" (137). Another example is the way in which sex was seen as a tool to infiltrate "the enemy" and destroy them (Brown 136). Although these practices may seem oppressive as they are done in part at the behest or encouragement of men, it is more nuanced than that. Taking control of one's body and sexual activity, and not allowing society's standards of morality, is a revolutionary and feminist act within itself. Most importantly, through this, it is clear that although the overall goal is Black liberation, another significant goal is Black women's liberation. It is also important to note that, by simple virtue of "infiltrating" and climbing the ranks of what started as a male only space is, in itself, an act of revolution and liberation.

Leaving The Panthers

Brown decided to step down in 1977, less than a year

after Newton returned to the U.S. from Cuba. Her departure from the position as chairwoman, and from the Party, was spurred by an approved attack on another Black woman. Regina Davis, an administrator for the Panther Liberation School, was beaten in a Newton authorized attack after reprimanding a male coworker after he did not do an assignment she told him to do (Brown 444). After the critical, climactic conversation with Huey Newton regarding the attack of Davis, a meeting was planned with the rest of the Central Committee. During her time in the Party, Brown became a willful feminist, doing all she could to push women to the forefront of the Party, and righting the wrongs they experienced at the hands of men in the Party. Because of this, she feared she would be beaten in the same manner as Davis if not killed. Brown soon fled Oakland and left the Panthers for good.

Critics may say that Brown's decision to leave goes against the feminist morals that led her to her position of power to begin with. However, I would argue that her decision to leave is tied to her feminist and liberationist approach to not only her politics, but her life as well. In "Resignation is a Feminist Issue" scholar Sara Ahmed argues:

"I began to realise how the system was working. I began to realise that the system was working. I began to realise too my own complicity with that system. I had previously known that the centre in which much of the harassment was happening was not a centre with which I could be connected: I found their whole ethos and culture to be incredibly sexist...What I came to realise was: this was not an issue of an individual person whose removal would remove the problem. Indeed the assumption that to remove a person is to remove a problem is often how the problem remains. This was an issue of institutional culture, which had become built around (or to enable) abuse and harassment." (Ahmed).

Although Ahmed is referring to her employer's policies on sexual assault on campus, the sentiment remains the same in Brown's case. She could no longer be complicit in, nor connected to, the Party's mistreatment of women. The attack on Davis was the last straw for Brown. Based on her personal and political morals, she had no choice but leave the Party. Even removing the perpetrators of her attack would not have solved the problem. Like Ahmed, Brown realized that the issue was not of individual persons, but an institutional culture that permitted the attack to take place.

Conclusion

The goal of Brown writing *A Taste of Power* was not only to tell her story, but the story of women within the movement. It was to shift the dominant narrative that usually is told about women. The decision to use a memoir as her preferred medium was key. A memoir has a singular voice, and it cannot be silenced in the same way a speech can. It gives the author the agency to tell their story, through their eyes, which is something women of the Black Power movement were not about to do before her. Using any oth-

er medium, Brown would have been unable to craft her story and its narrative in the way her narrative presents it. the chance that she would be able to shape her story and shape the way in which she told that story, would have been that much harder.

A Taste of Power was published in 1992, so it is clear that her focus and goal was to shape the story of the movement and how it is interpreted in the future and its influence on society, specifically Black women. Almost thirty years had passed since Stokely's speech when this memoir was published. The narrative of the Black Power movement, at this point, had been set in stone. Even during its present time, Black Power was seen as a male dominant identity, absent of any strong female voices. Brown, knowing the truth, wanted to shift this error in history. The way in which historians, social scientists, and cultural critics discuss the movement is primarily driven by the dominant narrative associated with it. The only way that the discourse around the movement changed was if someone who experienced the movement, especially to the degree of Brown, wrote a first hand account of their knowledge of what took place. The reason we have academics researching and uncovering the stories of women in this movement is because Brown established precedence with her memoir. Without the influence and effect of *A Taste of Power*, Bettie Collier-Thomas and V.P. Franklin wouldn't have the basis to write much of their 2001 book *Sisters in the Struggle: African American Women in the Civil Rights-Black Power Movement*, which focuses on the roles that women played in the freedom and liberation struggles of the 1960's and 1970's.

Without Brown, there would not be visible Black women leading the movement against police brutality and state violence. The Black Lives Matter movement was started in 2012 after George Zimmerman was acquitted in the shooting death of Trayvon Martin, a 17-year-old unarmed Black teenager. The organization was started by three Black queer women, Alicia Garza, Opal Tometi, and Patrisse Cullors. Not only did they found the movement, but continue to act as leaders of the movement years later. Black women Johnetta Elzie and Brittany Packnett lead *We The Protesters*, an organization dedicated to protesting state violence and police brutality across the United States.

Social and political activism within the Black community, historically, has been seen as male centric. It was seen as a boy's club where women were not allowed, or whose roles were reduced to housework and administrative tasks. They promoted and thrived off of masculine ideals, beliefs, and practices. Before Brown's memoir, the idea that a woman could successfully and strongly lead an organization or movement full of masculine Black men was unbelievable. Because of the work of Brown, these women had a role model to follow. This also plays back into Brown's choice to use a memoir to accomplish her rhetorical goals. Producing a true, autobiographical document was essential to ensuring ease of access to young women who would later join the struggle for liberation. Representation

is key when it comes to achieving a goal, especially for people of color or other marginalized groups. For future Black women, Brown's story showed that they could hold important, powerful roles in the liberation of Black Americans and Black people worldwide.

Elaine Brown's reasoning for leaving the movement was the same for writing the memoir: because regardless of the power a woman gained, she was still not respected in the movement. Malcolm X once said, "The most disrespected woman in America, is the black woman. The most unprotected person in America is the black woman. The most neglected person in America, is the black woman." This statement holds true, especially within the Black Power movement. Even Brown, who reached the proverbial mountaintop of the Black Power movement as chairperson of the Black Panther Party, was not respected or protected. Their stories and experiences were not respected. Their stories were ultimately hidden, silenced, and suppressed to support the belief of a male-centric story of Black Power. With this memoir, she effectively ended the era of suppression and dominance. More than anything, she successfully gave an accurate narrative of the movement and influenced a generation of Black female thinkers, writer, activists, and revolutionaries.

Works Cited

Abu-Jamal, Mumia. "A Woman's Party." *We Want Freedom: A Life in the Black Panther Party*. Cambridge, MA: South End, 2004. Print.

Ahmed, Sara. "Feminist Killjoys (And Other Willful Subjects)." *S&F Online*. Barnard Center for Research on Women, Summer 2010. Web. 06 Sept. 2016.

Ahmed, Sara. "Resignation Is a Feminist Issue." *Feminist killjoys*. 28 Aug. 2016. Web. 09 Jan. 2016.

Brown, Elaine. *A Taste of Power: A Black Woman's Story*. New York: Pantheon, 1992. Print. Carmichael, Stokely, and Michael Thelwell. *Ready for Revolution: The Life and Struggles of Stokely Carmichael (Kwame Ture)*. New York: Scribner, 2003. Print.

Charland, Maurice. "Constitutive Rhetoric: The Case of the

Peuple Québécois." *Quarterly Journal of Speech* 73.2 (1987): 133-50. Taylor & Francis Online. Web. 20 Apr. 2016.

Goodwin, Jeff, and James M. Jasper. *Rethinking Social Movements: Structure, Meaning, and Emotion*. Lanham, MD: Rowman & Littlefield, 2004. Print.

Joseph, Peniel M. "Black Power's Powerful Legacy." *The Chronicle Review*. *The Chronicle of Higher Education*, 21 July 2006. Web. 19 Feb. 2016.

Neal, Mark Anthony. "There's a New Black Man in America Today." *New Black Man*. New York: Routledge, 2005. Print.

Smith, Sidonie. "Review: Who's Talking/Who's Talking Back? The Subject of Personal Narrative." *Signs* 18.2 (1993): 392-407. JSTOR. Web. 11 Jan. 2017.

Student Nonviolent Coordinating Committee. "Student Nonviolent Coordinating Committee Position Paper: The Basis of Black Power." *SNCC: Basis of Black Power*. Institute of Advanced Technology in the Humanities. Web. 03 Mar. 2016.

Zinsser, William. Introduction. *Inventing the Truth: The Art and Craft of Memoir*. Ed. William Zinsser. New York: Houghton Mifflin Company, 1998. 1-22. Print.



Cameron Jernigan is a junior at the University of North Carolina at Chapel Hill. Originally from Ahoskie, NC, he is a Communication major and Education minor. His current research interests include: critical race theory, black men and masculinities, and minority student experiences in higher education. By and large, his interests sit at the intersections of race, class, and gender, and how those intersections affect politics, policy, and daily life. He completed this project as a part of a Spring 2016 Communication course, *The Rhetoric of Social Movements*. He previously presented this paper at the 2016 Feminisms Here and Now Conference at UNC-Chapel Hill.

Natural Sciences

75 - 79

A. tumefaciens Succinoglycan – Mutants
by Taylor Aliano, Brooke Bowman, Briana Stockdale, Lacie Morrison

Faculty Advisor: Dr. Grace Jenei, Biology

In their research, Taylor Aliano, Brooke Bowman, Lacie Morrison, and Briana Stockdale study colonies of *Agrobacterium tumefaciens* to find mutations in the regulatory genes of the succinoglycan biosynthetic pathway. By establishing colonies of *A. tumefaciens* with these mutations, the group aims to discern the effect of the mutation on the relationship between succinoglycan and crown gall, a tumorous plant disease. Using transform-mutant-screening and dyeing techniques, the group discerned a number of mutants that may prove useful in preventing crown-gall disease and will aid in future research.

80 - 86

Evaluation of Two Competing Hypotheses for the Contact with the Sage Hen Flat Pluton, White Mountains, Eastern California

by Lizzie D. Wilson, Jed D. Higdon, and Jack A. Davidson

Research Type: First-year Seminar

Faculty Advisor: Dr. Ben Harps, Mathematics

Through a first year seminar, Geology 72H, Lizzie D. Wilson, Jed D. Higdon, and Jack A. Davidson evaluated two competing hypothesis for the contact with the Sage Hen Flat Pluton, White Mountains, Eastern California. Traditionally there are two hypotheses about the contact of the Sage Hen Flat Pluton, Ernst and Hall concluded that it was a relatively straight fault, but in contrast Bilodeau and Nilson believe the contact is intrusive. To determine which hypotheses was correct, the students collected samples of the pluton and its wall rocks as well as mapping the structure. They measured the grain size and Strontium isotope present to better conclude how the rock formed. Their evidence supports the second hypothesis. s

A. tumefaciens Succinoglycan Mutants

by Taylor Aliano, Brooke Bowman, Briana Stockdale, Lacie Morrison

A. tumefaciens is most notable for causing crown gall – a plant disease that presents with growth or tumors, most commonly at junctions along the plant and on lower branches and stems. Mutations in the genome of *A. tumefaciens* affect the organism's ability to synthesize succinoglycan, relevant for the exopolysaccharide's role in attachment and biofilm formation. The role of succinoglycan in *A. tumefaciens* is not fully understood. Mutants lacking the ability to produce succinoglycan in sufficient amounts may prove useful in future research and preventative measures to protect against crown gall. This experiment used transformed-mutant-screening to distinguish bacteria with mutations in the succinoglycan biosynthetic pathway. Sudan Black B dye was used to as an indicator to identify possible mutants. Prior to this experiment, this technique had only been applied to *Rhizobium meliloti*, another plant bacteria that is essential to nitrogen fixation in alfalfa. Further research in this area should include sequencing to identify the site of the transposon insertions in the mutants obtained in this study and more specific identification of the regulatory genes involved in the succinoglycan biosynthetic pathway.

Keywords: *A. tumefaciens*, crown gall, Sudan Black B dye, succinoglycan, transposon mutagenesis

Introduction

The bacterium *A. tumefaciens* is a Gram-negative and rod-shaped. Found in soil, this bacterium infects plant hosts through wounds and is the causative agent of crown gall disease, a frequent source of crop loss. *A. tumefaciens* injects T-DNA into a plant host.¹ The DNA is then incorporated into the plant's genome where enzymes involved in the synthesis of plant growth hormones are produced to elicit rapid cell growth, ultimately resulting in tumors or galls.

The purpose of this experiment is to use transposon mutagenesis then characterize the resulting colonies for mutations affecting the succinoglycan biosynthesis pathway. The plasmid used to introduce the transposon carries an origin of replication which is not functional in *A. tumefaciens* and a gene for tetracycline resistance. These characteristics allowed for selection of transformed *Agrobacterium* that received the transposon. The transformed bacteria were then screened for mutants incapable of producing the exopolysaccharide succinoglycan using Sudan Black B dye. The ultimate goal of this experiment was to isolate *A. tumefaciens* mutants deficient in production of succinoglycan.

In this study, we investigated mutant *A. tumefaciens* defective in the production of the exopolysaccharide succinoglycan. The purpose of succinoglycan in *A. tumefaciens* is not completely clear. Bacteria lacking in this substance are still able to adhere to plant surfaces and produce biofilms without decreased virulence.² However, as an exopolysaccharide, succinoglycan is likely necessary for resilience mechanisms in response to environmental stressors such as desiccation. Isolation of *A. tumefaciens* mutants deficient in succinoglycan production would be useful for the identification of the specific roles of succinoglycan in the bacteria, and could result in the identification of additional regulatory genes involved in succinoglycan biosynthesis in *A. tumefaciens*.

Methods and Materials:

Transposon mutagenesis

The plasmid pUTminiTn5gfp was introduced into the bacteria *A. tumefaciens*.³ Selection for *A. tumefaciens* carrying the plasmid was ensured by subsequent plating of the bacteria on tetracycline, for which the transposon on the plasmid encoded resistance. In order to isolate the plasmid used for this transformation, two mL of *E. coli* cul-

ture were placed in an Eppendorf tube and centrifuged for one minute. The supernatant was poured off and the bacteria were re-suspended by vortexing in 100 microliters of solution P1, which contained RNase A, EDTA and Tris-chloride. After the addition of 100 μ L of another solution, P2, containing 0.2M NaOH and 1% SDS, the bacteria were mixed by inversion and incubated for five minutes to allow the bacteria to lyse. Finally, solution P3, which contained 3 M KOAc at pH 5.0, was added and the bacteria were centrifuged for 10 min. The bacterial supernatant was transferred to a new tube, excluding the white precipitate pellet which contained cell wall fragments and chromosomal DNA. Two hundred fifty microliters of i-PrOH was added and again, the solution was centrifuged for 10 minutes. The supernatant was carefully removed with a micropipette and the pellet was washed with 70% EtOH. The pellet was dried and 35 μ L of water were added to the pellet and stirred with the pipette tip. Competent *A. tumefaciens* C58 suspended in 20 mM cCaCl₂ solution were then transformed through the addition of 10 μ L of plasmid DNA and subsequent freezing, warming, and yeast extract peptone medium supplementation.

Preparation of *A. tumefaciens* colonies

Dilutions were made from the suspension of transformed *A. tumefaciens* with 0.1 mL of the cell culture and 0.9 mL of 0.9% NaCl. Dilutions were also made with 0.1 mL of the cell culture and 0.9 mL of phosphate buffer. Dilution strengths used were 1:1000 to 1:10000. Dilutions were spread on minimal media plates containing tetracycline and incubated at 25 °C for 2-3 days.

Selection and Transfer of Colonies

Mutant colonies ready to isolate are well established but not so dense as to cause cross-colony contamination. Minimal medium culture plates were checked after 48 hours and each day following. Colonies were picked using sterile toothpicks or a sterile loop. Toothpicks were sterilized by autoclaving, while the sterile loop was sterilized through flaming with a Bunsen burner. When using the sterile loop, caution must be used not to expose to bacteria to excessive heat, so it is advised to cool the loop before picking the colony. Colonies which were able to be picked separately were isolated using the chosen instrument and spread onto a minimal media agar plate equipped with a template so that the colonies did not touch and are easily distinguished. Streak technique was gentle enough so that plate agar was not ripped and the bacteria remained on the surface. After each template plate was finished, the process was repeated for forty separate plates, originals and duplicates, and incubated for 2-7 days or until colonies were well established and clearly adhered to the agar.

Dye Application

A 0.02% solution of Sudan Black B dye diluted with 96% ethanol was utilized to dye the mutants.⁴ About 100 mL of dye was prepared per ten plates. After the dye solution was made, 8 mL was gently pipetted over each plate of grown mutants, with care to avoid dislodging the colonies.

The dye was left for approximately ten minutes and subsequently poured off into a designated waste container. Ten mL of 96% EtOH was used to rinse the colonies which was applied gently.⁴ The plate was swirled for about a minute to ensure the dye solution was rinsed off. The liquid remaining on the plate was emptied into the waste container and a final rinse with distilled water was performed.

Screening for Mutants

Mutants could be visually identified. Identification was performed in a well-lit area or under the light from a lamp. White paper was also applied underneath the plates to aid in identification. Mutants appeared to absorb the dye along the borders of the colonies to varying extents depending on the mutant phenotype.

Results

Over the course of this experiment, 1,026 distinct mutant colonies were plated using more than twenty distinct minimal media agar plates, with duplicates, containing tetracycline. Only 728 of these colonies could be analyzed for succinoglycan mutant status due to difficulties associated with the dyeing process and growth of fungi on the plates (Fig. 1). It appeared that bacterial adherence was one of the greatest issues resulting from the dyeing process. Those bacterial colonies that were plated with sterile loops as opposed to toothpicks exhibited greater rates of detachment from the agar during the dyeing process. The result of this detachment was the breakage of colonies and loss of colonies during ethanol and dye removal from the plates. Therefore, many colonies were lost or damaged to an extent that made mutant analysis too challenging to return definitive results.

Those colonies that were analyzed for mutant status included seven possible succinoglycan mutants. All of the possible succinoglycan mutants found were deemed 'light' mutants because they retained a reduced portion of dye at the edges of the colonies with respect to the majority of plated colonies. One of these mutants contained a reduced amount of dye at the colony edges to an extent that was less reduced than the other six mutants. The plates were flooded with a minimal amount of dye. This was done to prevent detachment of colonies; however, it inhibited the bacteria from being fully submerged in the dye. The result was colonies that absorbed dye solely around their borders.

Currently, there are fourteen different genes that have been identified as participants in the biosynthesis of succinoglycan in *Agrobacterium fabrum* C58.⁵ It is possible that there are more unidentified genes involved in the pathway, but it would be difficult to determine exactly how many at this time. The expected frequency of succinoglycan mutants in random transposon mutagenized *A. tumefaciens* C58 is 0.26% or 0.002584 (Calc. 1). Therefore, about 2.6 colonies in every 1000 mutants should exhibit mutations in the succinoglycan biosynthetic pathway. The observed frequency of succinoglycan mutants in this experiment is 0.96% or 0.009615 (Calc. 2). If all of the

possible succinoglycan mutants identified during this experiment were true mutants then this indicates that there are likely more genes involved in succinoglycan biosynthesis than have been identified yet, approximately 48 (Calc. 3).

Discussion:

This experiment resulted in seven possible identifiable mutants. There are currently fourteen known genes that are responsible for the production of succinoglycan in *A. tumefaciens*.⁵ The experiment was successful in isolating seven identifiable mutants deficient in production of the exopolysaccharide succinoglycan. Organisms typically use polysaccharides as a storage unit for energy or as signaling molecules in some bacteria or as protectants against environmental stress such as desiccation.⁶ However, the role of succinoglycan in *A. tumefaciens* is not fully understood.² There is evidence that it may act as a binding agent in biofilm production.⁷

All of the succinoglycan mutants identified were classified as light mutants due to reduced dye retention around the edges when compared to other colonies. Of the seven mutants, six retained significantly reduced amounts of

may be involved in other group addition and regulation of succinoglycan production. In the case of the mutant that retained more dye than the rest of the identified mutants, these mutant bacteria may still produce succinoglycan but simply in a reduced amount. This specific reduction in succinoglycan could be the result of a mutation in the regulatory process of succinoglycan production causing decreased production, or the result of a variation in the side chains of succinoglycan. Those mutants that exhibited complete reduction of dye retention were likely mutated in genes that are necessary for succinoglycan production, such as a glycosyltransferase. Further isolation and genotyping of the bacteria would be necessary to confirm these hypotheses.

There are at least 14 known distinct single succinoglycan production mutant types that could be produced.⁵ Based on our calculations of succinoglycan mutant frequency in this experiment, there may be as many as 48 genes involved in succinoglycan production. If this is the case, there may be as many as 48 distinct single succinoglycan mutant types that could be produced. Unidentified genes involved in succinoglycan biosynthesis in *A. tumefaciens* may perform a variety of functions including side

CALCULATION 1. EXPECTED FREQUENCY OF SUCCINOGLYCAN MUTANT IN RANDOM A. TUMEFACIENS C58 MUTANTS

*Approximate length of A. tumefaciens C58 genome = 5,672,871 base pairs (bp)*⁵

*Approximate total length of all genes known to be involved in succinoglycan biosynthesis = 14,658 bp*⁵

Expected frequency = $14,658 \text{ bp} / 5,672,871 \text{ bp} = 0.002584$ or 0.26%

CALCULATION 2. OBSERVED FREQUENCY OF SUCCINOGLYCAN MUTANTS

Number of succinoglycan mutants identified = 7

Number of mutants analyzed for mutant status = 728

Observed frequency = $7/728 = 0.009615$ or 0.96%

CALCULATION 3. ESTIMATION OF NUMBER OF GENES RESPONSIBLE FOR SUCCINOGLYCAN MUTANT PHENOTYPE

0.96% (observed frequency) x 5,672,871 bp = 54,544 bp

Average length of genes known to be involved in succinoglycan biosynthesis = 1127 bp

54,544 bp / 1,127 bp = 48.4 genes

dye on their colony borders and one retained a slightly reduced amount. Reduced retention of the Sudan Black B dye is likely a result of reduced concentrations or lack of succinoglycan in these colonies. This is believed to be a result of mutations within the succinoglycan biosynthetic pathway or in genes regulating the synthesis of succinoglycan. Genes involved in this pathway include glycosyltransferases that transfer glucosyl groups onto succinoglycan intermediates.⁵ Other genes are less understood but

group addition. Sequencing of mutants produced during this experiment would aid in identifying additional genes in the biosynthetic pathway. Additionally, careful comparison of succinoglycan mutant colony morphologies may help in understanding the role of each gene in succinoglycan structure formation and distribution.

Possible sources of error throughout this experiment include lack of sterile technique. Contamination of the plates was a major concern, as multiple colonies could not

be analyzed due to fungal growth. It is possible that some of the contaminated colonies would have been additional mutants. Concerning the dyeing procedure, only enough dye was used to partially submerge the individual streaks. This resulted in dye adherence to only the border of the colonies. Using any more dye would have increased the chances of washing away bacteria but could have provided better-stained colonies for comparison. Additionally, puncturing the agar with toothpicks when plating the bacteria made some colonies difficult to analyze as possible mutants. At times during the experiment, a sterile loop was used to streak the plate instead of toothpicks, causing some bacterial colonies to break apart and not adhere to the plate. In future experiments, adjustments should include ensuring sterile technique is applied diligently and care is taken when transferring colonies to the agar. Additionally, dye solution should be added carefully, so the colonies of bacteria are not washed off the plate.

Works Cited

1. Madigan, M. T., Martinko, J. M., Bender, K. S., Buckley, D. H., & Stahl, D. A. (2015). Epidemiology - Infectious diseases and their transmission. In Brock Biology of Microorganisms (pp. 827–922). Glenview, IL: Pearson Education, INC.
2. Heindl, J. E., Wang, Y., Heckel, B. C., Mohari, B., Feirer, N., & Fuqua, C. (2014). Mechanisms and regulations of surface interactions and biofilm formation in *Agrobacterium*. *Frontiers in Plant Science*, 5. Retrieved from <http://journal.frontiersin.org/article/10.3389/fpls.2014.00176/full>
3. Matthyse AG, Stretton S, Dandie C, McClure NC, Goodman AE. 1996. Construction of GFP vectors for use in gram-negative bacteria other than *Escherichia coli*. *FEMS Microbiol Lett*. 145:87-94.
4. Liu, M., Gonzalez, J. E., Willis, L. B., & Walker, G. C. (1998, November). A Novel Screening Method for Isolating Exopolysaccharide-Deficient Mutants. *Applied and Environmental Microbiology*, 64(11), 4600-4602
5. Succinoglycan, database *Agrobacterium fabrum* C58. (2016). Retrieved from <https://biocyc.org/AGRO/substring-search?type=NIL&object=succinoglycan&quickSearch=Quick Search>
6. Appling, Dean Ramsay, Spencer J. Anthony-Cahill, and Christopher K. Mathews. *Biochemistry: Concepts and Connections*. Boston: Pearson, 2016. Print.
7. Tomlinson et al. "Agrobacterium tumefaciens ExoR represses succinoglycan biosynthesis and is required for biofilm formation and motility. *Microbiology*. 2010 Sep; 156(Pt 9): 2670–2681. doi: 10.1099/mic.0.039032-0

Taylor Aliano



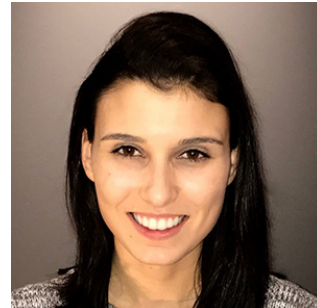
Brooke Bowman



Lacie Morrison



Briana Stockdale



In an advanced laboratory course on microbiology, four students with diverse backgrounds and varied interests were brought together to complete a mentored research project on bacterial genetics. The current research was conceptualized and completed utilizing the variety of skills and techniques brought to the research team by these individuals. Taylor Aliano will be graduating this spring with the hopes of obtaining her master's in clinical laboratory science before beginning a doctoral program in microbiology. Her interests include infectious disease and antibiotic resistance. Brooke Bowman will also be graduating in the spring with a B.S. in biology and a minor in chemistry. She currently works as a pharmacy technician for Walgreens and plans to attend pharmacy school after graduation. Lacie Morrison's research interests include infectious disease, immunology, and genetic markers of disease. She plans to attend the University of North Carolina at Greensboro to attain a master's in public health. Briana Stockdale graduated from UNC in December of 2016 with a B.S. in biology and minor in chemistry. She is currently working as a veterinary assistant at an animal hospital in Durham, NC. She will begin at the Cummings School of Veterinary Medicine at Tufts University in Fall 2017. She hopes to specialize as a zoological veterinarian, treating patients and aiding in the effort to preserve endangered species.

Evaluation of Two Competing Hypotheses for the Contact with the Sage Hen Flat Pluton, White Mountains, Eastern California

by Lizzie Wilson, Jed Higdon, and Jack Davidson

There are two different interpretations of the contact relations of the Sage Hen Flat pluton, an isolated Jurassic granite in the White Mountains of eastern California. Ernst and Hall (1987) mapped the northwestern contact as a relatively straight fault, whereas Bilodeau and Nelson (1993) interpreted the contact as intrusive. To investigate these two claims, we mapped the contacts and collected samples of the pluton and its wall rocks. We observed granite dikes cutting the Deep Spring Formation at the contact, which suggested intrusion, and did not find any offset contacts to corroborate the faulting hypothesis. We then analyzed the samples for grain size and Strontium (Sr) isotope ratios to determine whether the pluton had thermal or hydrothermal interactions with the metamorphic wallrock. Wall rock grain sizes coarsen closer to the pluton contact. Crystal coarsening in Deep Spring Formation limestone as the contact is approached suggests recrystallization by the added heat of a cooling plutonic body. Consistent with this, our samples of granite contain smaller crystals near the contact and larger crystals away suggesting the rock at the contact crystallized quicker as it gave up heat and fluid. Our $^{87}\text{Sr}/^{86}\text{Sr}$ data support intrusion as well. Sr isotopic data from the wall rocks follow a typical mixing trend, consistent with fluid exchange between the pluton and its wall rocks. Our evidence supports the Bilodeau and Nelson interpretation of the area, in which the contact between the northwest side of the Sage Hen Flat pluton and the surrounding rock is a complex intrusive contact, rather than a fault.

Keywords: *Agrobacterium tumefaciens*, crown gall, Sudan Black B dye, succinoglycan, transposon mutagenesis

Introduction

The Sage Hen Flat pluton in the White Mountains of California (Fig. 1) is a classic example of “cookie-cutter” emplacement, where metasedimentary strata appear to be chopped off at the pluton (intrusive igneous rock, such as granite) contact (Coleman et al. 2005). The Deep Spring Formation borders the northwestern side of the Sage Hen Flat pluton (Fig. 1). The Late Proterozoic aged Deep Spring Formation includes several different carbonates, as well as fine-grained orange and brown sandstone, skarn, and shale. The Sage Hen Flat pluton is much younger than the

surrounding carbonates, with a U-Pb zircon age of ~175 m.y. (Coleman et al. 2005). It has been mapped three times (Nelson, 1966; Ernst and Hall, 1987; Bilodeau and Nelson, 1993). Although these maps are broadly similar, interpretation of the contact on the northwestern side of the pluton is controversial. Bilodeau and Nelson interpreted this area as a complex intrusive contact (Fig. 2.a), whereas Ernst and Hall mapped it as a fairly simple fault (Fig. 2.b).

These two interpretations have significantly different implications for the emplacement of the pluton and for effects upon the wall rock. If the contact is intrusive,

then we should expect changes in crystal size in both the wall rocks and pluton: coarsening of wall rock carbonates approaching the contact due to recrystallization and fining of the pluton toward the contact due to chilling. If the contact is a simple fault, we should not expect to see any dramatic changes in the texture of either the carbonates or the pluton. We should also expect to find evidence of fluid exchange at an intrusive contact using Sr isotope analysis. ^{87}Sr is radiogenic and is derived from ^{87}Rb , whereas the concentration of ^{86}Sr on the Earth is constant. Therefore, as rocks age, $^{87}\text{Sr}/^{86}\text{Sr}$ increases. Unaffected Deep Spring limestone has a $^{87}\text{Sr}/^{86}\text{Sr}$ of $\sim .7135$, whereas the Sage Hen Flat pluton has a $^{87}\text{Sr}/^{86}\text{Sr}$ of $\sim .705$ (D. Coleman, personal communication, 2016). Fluid exchange between limestone and granite should cause the affected limestone to have a much lower $^{87}\text{Sr}/^{86}\text{Sr}$ than unaffected limestone. If the contact is intrusive rather than faulted, the data should reflect a hyperbolic mixing model. In order to decide which interpretation of the contact is valid, we examined the contact, studied crystal size at varying distances from the contact, and analyzed the isotopic composition of the carbonates.

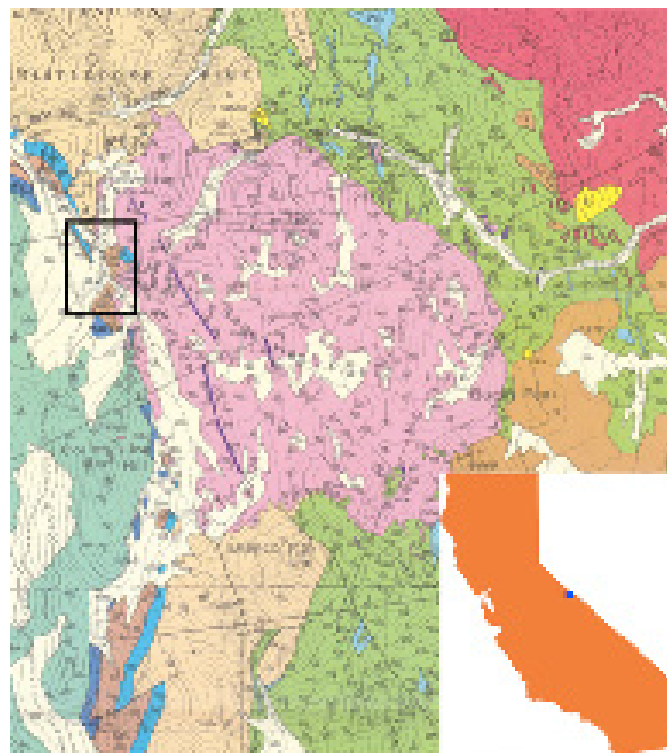


Figure 1. Section of the Blanco Mountain 15' quadrangle in the White Mountains of California. The Sage Hen Flat is the pink ovular formation in the center. We examined the northwest contact between the pluton and the Deep Spring Formation in the square pictured (Bilodeau and Nelson 1993).

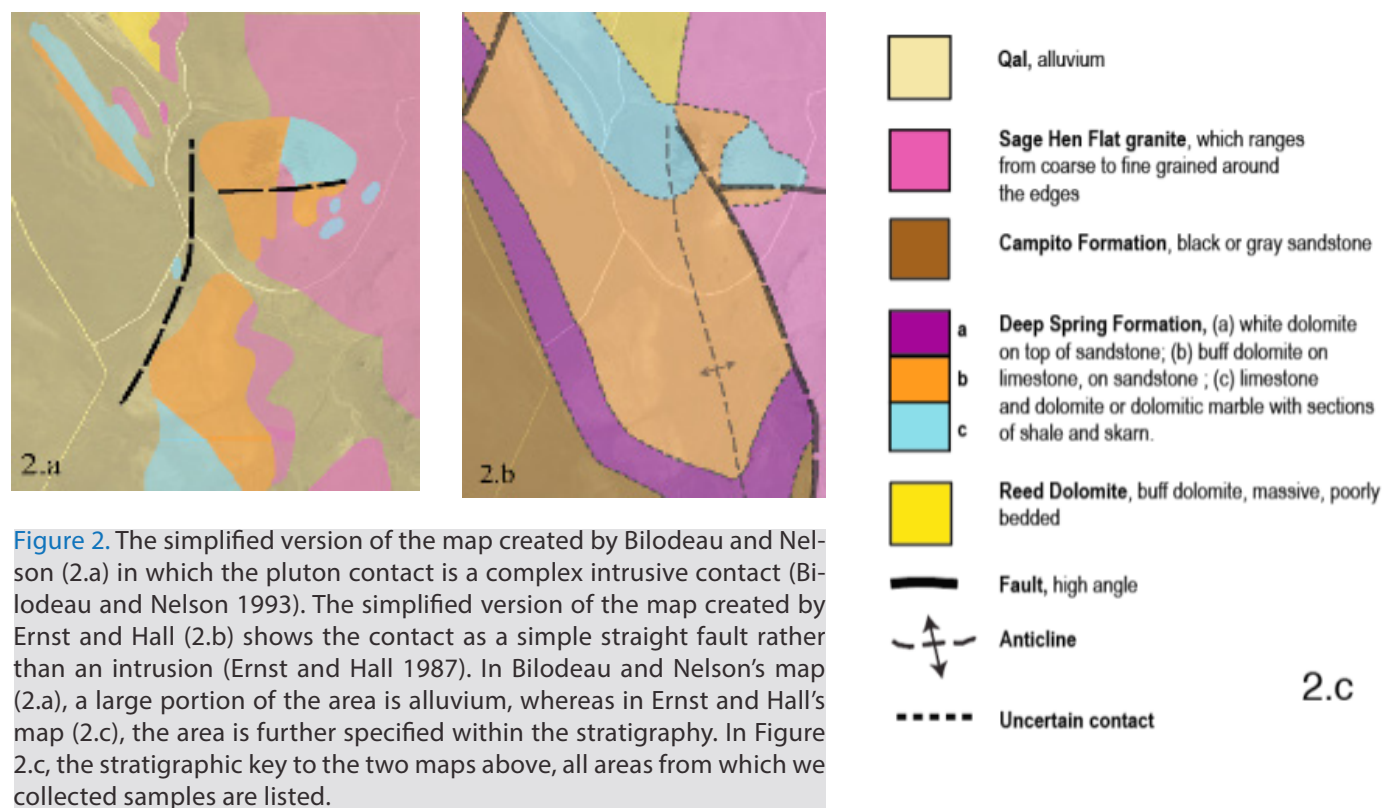




Figure 3. Our sample locations in relation to the granite contact.

Methods

Mapping and Sample Collection

What was once a small, rural, and marginalized guerrilla We collected samples from both the pluton and the wall rock from both far and near to the contact to determine if such fluid exchange and grain size patterns exist. We also mapped the pluton contact for evidence of faulting or intrusion. We collected 22 samples of dolomite, limestone, granite, sandstone, and skarn from outcrops both far from and near the contact between the Deep Springs Formation and the Sage Hen Flat pluton (Fig. 3). We used the dolomite, limestone, and granite to compare relative contact metamorphism and grain size to distance from the contact; we used all seven limestone samples to compare their $^{87}\text{Sr}/^{86}\text{Sr}$ to that of a calculated hyperbolic fluid mixing model.

Ion Analysis and Fluid Mixing

We ran columns on 7 samples of Deep Spring limestone: CC1605, CC1612, CC1613, CC1614, CC1615, CC1616, and CC1617. The first five samples were taken from outcrops close to the contact near the pluton, in the central clump of samples (Fig. 3). Samples CC1616 and CC1617 were a greater distance away from the pluton, with sample CC1616 vertically far from the pluton on top of the central hill and sample CC1617 horizontally far from the pluton (Fig. 3). The samples were crushed to roughly 2 mm chips. One at a time, we gathered 5-15 mg of each sample and put them into separate 7 mL Saville beakers. The samples were dissolved in 525 μL of 3.5 M HNO_3 and spiked with ^{84}Sr tracer. When running columns, we isolated the Sr using Sr-SpecTM resin following standard University of North Carolina at Chapel Hill Department of Geological Sciences protocol (D. Coleman, personal communication, 2016). 1 drop of 1.00 M H_3PO_4 was added to the samples and they were evaporated to dryness. Samples were then loaded onto single Re filaments, and, using TaF,



Figure 4. A granite dike intruding through the sandstone at the contact.

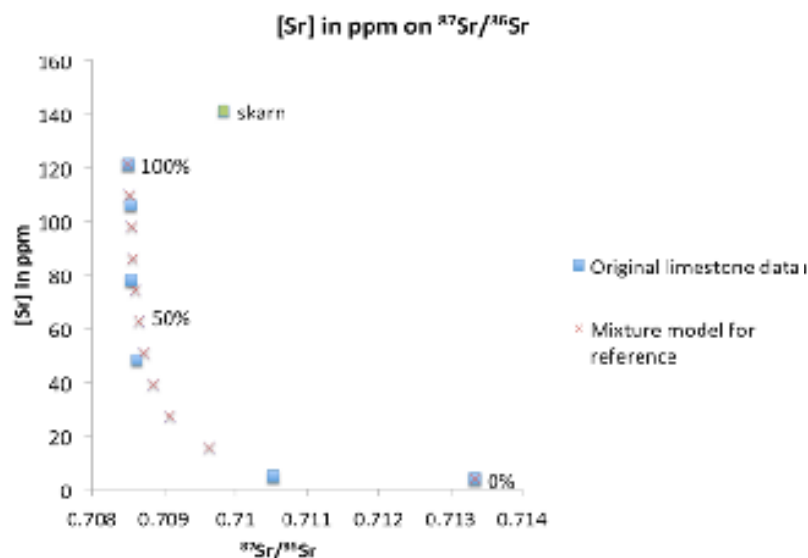


Figure 5. In this graph of $^{87}\text{Sr}/^{86}\text{Sr}$ on ^{87}Sr ppm, our data, shown as blue squares, closely follow the mixture model, shown as red Xs. If we use the extreme values as end members, .7133 and .7085, the remaining 4 limestone samples follow a hyperbolic curve. The data points for the reference model were altered at 10% intervals of fluid. The green square represents the sample of skarn, CC1614. The bar on the left side of the x-axis represents the $^{87}\text{Sr}/^{86}\text{Sr}$ of the Sage Hen Flat pluton of .705 – .706 (D. Coleman, personal communication, 2016).

evaporated again to dryness. The samples were loaded into a VG-Sector-54 thermal ionization mass spectrometer. The samples were analyzed in triple dynamic mode with $^{88}\text{Sr}=3\text{V}$ using $10^{-11} \Omega$ resistors and then corrected for mass fractionation, assuming $^{86}\text{Sr}/^{88}\text{Sr} = .11940$ and exponential fractionation behavior. Replicate analyses of NBS-9 ^{87}Sr yield $^{87}\text{Sr}/^{86}\text{Sr} = .710269 \pm .000015$ (2σ). After we gathered our data from the mass spectrometer, we calculated the respective ppm of ^{87}Sr using a programmed spreadsheet and plotted ppm ^{87}Sr on $^{87}\text{Sr}/^{86}\text{Sr}$ to compare our data to the a standard fluid mixing model. We used the following end members with mixture at 10% intervals in the fluid mixing model for ^{87}Sr : $^{87}\text{Sr}/^{86}\text{Sr} \approx .7133$ and $^{87}\text{Sr}/^{86}\text{Sr} \approx .7085$.

Crystal Size

To quantify the dolomite, limestone, and granite crystal sizes, samples from both near to and far from the contact were polished and cross sections of the polished samples were photographed. The crystals were then measured using the images.

The samples were first cut to fit in 1 inch rounds with a Buehler low speed saw. They were then mounted in epoxy within 1 in. rounds and cut again so that an open plane of the rock was exposed. Using a Struers LaboPol-5 polisher, the samples were polished until a larger maximum exposure of the rock was determined; they were polished down to a 1 micron grit. Both the samples and the polisher were washed using distilled soapy water and distilled water in between grits. Once the grain boundaries were obvious without the aid of equipment, the rocks were photographed at 100x magnification with an Olympus petrographic microscope. A polarizing lens was used to increase the contrast between crystals. The granite samples exhibited crystals that were large enough to observe without the microscope; this round was photographed using a scanner. The images were then uploaded onto ImageJ and a common pixel length was established for 1 mm. The crystal sizes were then hand measured on the two dimensional cross sections of the rock. The greatest distance across each crystal was taken and the crystal sizes were compared to their distances from the contact. Each sample's location was plotted on Google Earth and a straight line was drawn between each sample and the nearest contact with granite.

Mapping

Offset contacts were found while mapping the area, however, these contacts were perpendicular to the pluton's contact with the wall rock and were not in the disputed contact area. Another key observation was that multiple granite dikes cut the wall rock at the contact, one of which is in Figure 4 (Fig. 4).

Strontium

$^{87}\text{Sr}/^{86}\text{Sr}$ plotted with Sr concentration closely follows the strontium fluid exchange model (Fig. 5). The end members were derived from the extremes of our $^{87}\text{Sr}/^{86}\text{Sr}$ data set. Samples CC1616 and CC1617 experienced the least fluid exchange, their $^{87}\text{Sr}/^{86}\text{Sr}$ close to the limestone end

Sample Type/ Number	Distance from Granite Contact (m)	Average Crystal Size (mm)
Dolomite		
CC1607	20	0.209
CC1608	80	0.299
CC1622	8,000	0.101
Limestone		
CC1614	10	0.578
CC1616	30	0.264
CC1612	32	0.302
CC1617	565	0.175
Granite		
CC1610	0	0.769
CC1621	50	1.716

Figure 6. The average crystal size of different rocks in the region compared to their proximity to the contact with the pluton.

member (Fig. 5). The other 5 samples experienced much greater fluid exchange, their $^{87}\text{Sr}/^{86}\text{Sr}$ altered heavily by the low $^{87}\text{Sr}/^{86}\text{Sr}$ of the pluton. Sample CC1614, the one outlier of the data set marked in green, was retroactively examined and determined to be skarn rather than limestone (Fig. 5).

Figure 5. In this graph of $^{87}\text{Sr}/^{86}\text{Sr}$ on ^{87}Sr ppm, our data, shown as blue squares, closely follow the mixture model, show as red Xs. If we use the extreme values as end members, .7133 and .7085, the remaining 4 limestone samples follow a hyperbolic curve. The data points for the reference model were altered at 10% intervals of fluid. The green square represents the sample of skarn, CC1614. The bar on the left side of the x-axis represents the $^{87}\text{Sr}/^{86}\text{Sr}$ of the Sage Hen Flat pluton of .705 – .706 (D. Coleman, personal communication, 2016).

Crystal Size

Limestone samples CC1616 and CC1612, less than 30 m from the contact with granite, have much larger crystal size than that of sample CC1617, which is over 500 m from the contact, as seen in Figure 6 (Fig. 6). The dolomite's average crystal size in samples CC1607 and CC1608, less than 80 m away from the contact with granite, also had much larger average crystal size than sample CC1622, which was 8000 m away from the contact (Fig. 6). The average granite crystal sizes in CC1610, which was directly on the contact with the surrounding carbonates, were smaller than CC1621, which was 50 m away from the contact (Fig. 6). Average crystal size vs. distance from the contact are graphed in Figure 7 (Fig. 7). In Figures 8 and 9, the visible crystals at 100x magnification are larger in both the limestone and the dolomite near the contact than they are away from

the contact (Fig. 8 and 9). In Figure 9, the largest crystals on the near sample, CC1607, have visibly recrystallized into larger grains than in its far counterpart seen on the right side of the image, sample CC1622. In Figure 10, the crystals in granite sample CC1610, directly on the contact, are visibly much smaller than that of sample CC1621, nearly 50 m from the contact, even without ma-

Trends

Our data's almost absolute conformity to the hyperbolic Sr fluid mixing model corroborates the crystal size data (Fig. 5). The fluid composition of the limestone was severely altered, an effect typical of complex intrusive contacts. This pattern of data is in line with the interpretation of the contact proposed by Bilodeau and Nelson (1993), as fluid exchange could not have occurred if the contact between the pluton and the carbonates were a simple fault.

The carbonates experienced a net

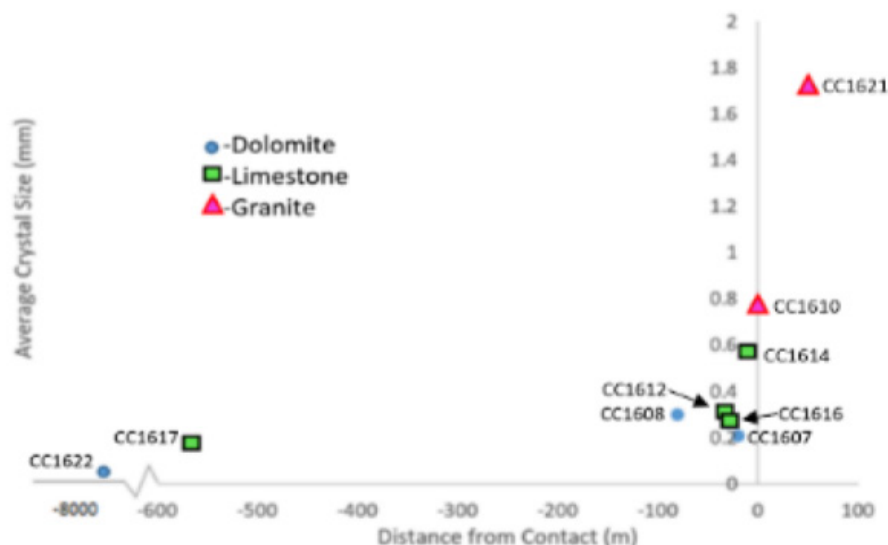


Figure 7. Dolomite, limestone, and granite average crystal sizes were plotted against their distance from the contact. The carbonates that have larger crystal size are generally closer to the contact, whereas the opposite is true of granite.

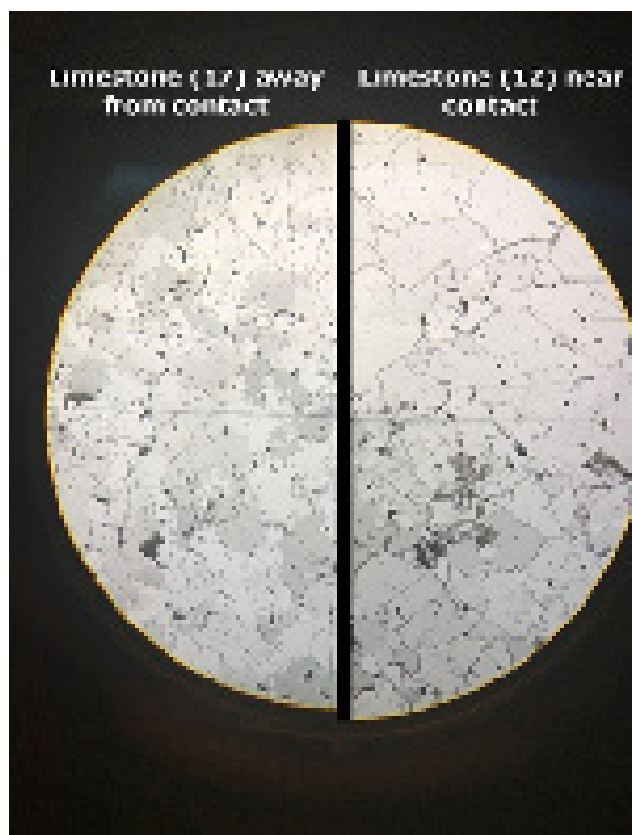


Figure 8. Polished limestone far and near the contact at 100x magnification. Sample CC1612 (right) and sample CC1617 (left).

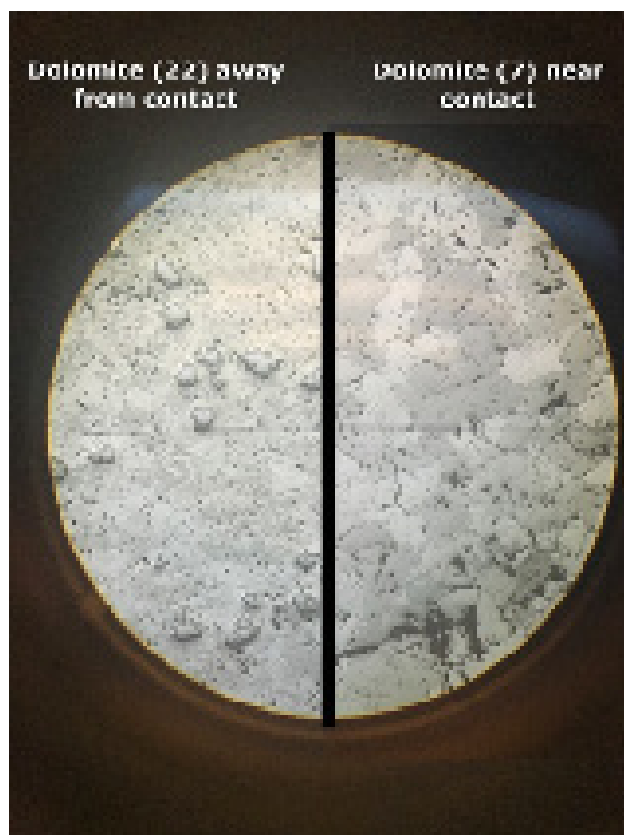


Figure 9. Polished dolomite far from and near to the contact at 100x magnification. Sample CC1607 (right) and CC1622 (left).

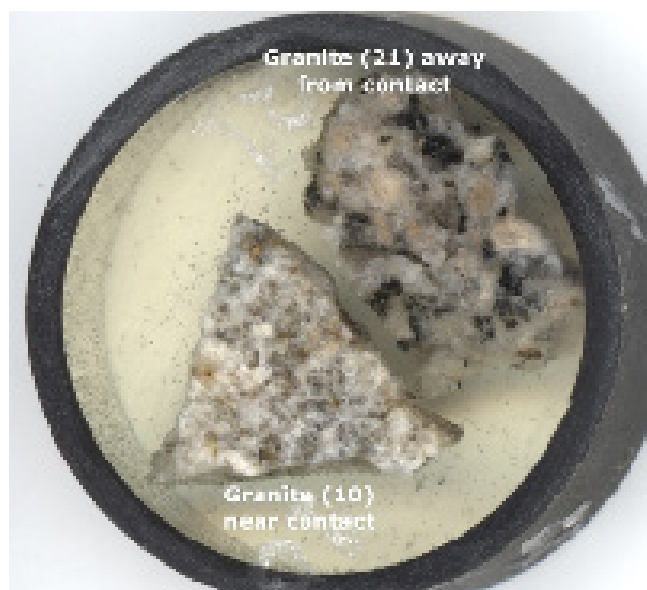


Figure 10. Polished granite far and near the contact at 100x magnification. Sample CC1621 (top right) and CC1610 (bottom left).

increase in crystal size with proximity to the contact with granite, whereas the granite experienced a net decrease in crystal size with proximity to the contact (Fig 7). The significant changes in rock texture, from coarsening to fining, can be attributed to large heat changes within the region and contact metamorphism. The trend in crystal size in the carbonates and in the granite reflects typical behavior of wall rock and plutonic rock near an intrusive contact, and corresponds well with the interpretation of the contact proposed by Bilodeau and Nelson (1993). Our discovering a granite dike in the sandstone further suggests intrusion and potential for fluid exchange.

Anomalies

We saw a fairly consistent trend of increasing crystal size with proximity to the pluton within the carbonates, but it is important to note the slight differences. In dolomite, the sample CC1608 is 60 m farther from the contact than CC1607, but the average crystal size is smaller. This anomaly is also present within limestone; sample CC1612 is about 2.5 m farther from the contact than sample CC1616, but the crystals are larger (Fig. 5). This does not change the integrity of our assertions because the crystal size difference and distances are small within the context, and the overall trend is not impacted. This anomaly is due in part to the way in which plutons are intruded. The contact between the granite and the carbonates does not extend straight down into the ground, but rather, it is likely that the pluton extends underneath the carbonates in places we cannot see or measure. For instance, the samples we deemed to be 80 m from the contact may in fact only be 10 m away because the pluton is directly underneath the outcrop. This means that the heat from the pluton coarsened carbonates farther from the visible contact than we would expect.

In the Sr study, there was one outlier of the data set

(Fig. 4), sample CC1614. This sample was retroactively determined to be skarn rather than limestone. Skarn should not react to fluid exchange in the same manner as limestone as it has different composition and properties. Therefore, sample CC1614's deviance from the other data is expected. There was also a discrepancy between the $^{87}\text{Sr}/^{86}\text{Sr}$ of limestone samples that experienced greater fluid exchange than the natural $^{87}\text{Sr}/^{86}\text{Sr}$ of the Sage Hen Flat pluton. The smallest $^{87}\text{Sr}/^{86}\text{Sr}$ in our data was $\sim .7085$ (Fig. 4), whereas the original $^{87}\text{Sr}/^{86}\text{Sr}$ of the pluton is .705 to .706. This reflects the impurity of the fluid within even the most affected limestone samples. The limestone had varying mixtures of its original fluid and that of the pluton; we should not expect the limestone to ever have pure Sage Hen Flat pluton fluid.

Additional Factors

We must also note that the crystallization we observed may not have been caused by the Sage Hen Pluton alone. As Dr. Bartley demonstrated with the McDoogie pluton, adjacent plutons can radiate heat through newer ones to recrystallize their rock and surrounding layers (Stears and Bartley, 2015). A disparate and unexposed pluton may have further crystallized the surface material. In order to prove if such was the case, we could turn to metamorphic petrology. We could search for certain minerals in the surrounding rock which only form in high temperatures and pressures. We could then examine the size of the pluton and deduce whether or not the pluton was capable of contributing enough heat to form such minerals.

Conclusion

In the comparison between the Bilodeau-Nelson (1993) and the Ernst-Hall (1987) interpretations of the contact between the Sage Hen Flat pluton and the surrounding Deep Spring Formation, we analyzed the land formations of the area, the crystal size changes at varying distances, and the changes in isotopic composition of the carbonates. Our data reveal that the physical and chemical changes in the surrounding wall rock and in the pluton itself likely occurred because of intrusion. The changes we observed in the texture of carbonates and granite near the contact, as well as the evidence of fluid mixing between the carbonates and the granite, strongly suggest that the contact is intrusive and not a simple fault. Our observing a granite dike also strongly supports this idea. Such is in line with the interpretation of the contact proposed by Bilodeau and Nelson (1993).

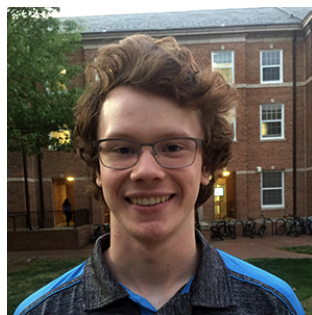
Acknowledgments

The Department of Geological Sciences at the University of North Carolina at Chapel Hill is entirely responsible for providing us with the guidance, equipment, and travel accommodations to complete our research. We would like to acknowledge the Sierra Nevada Aquatic Research Laboratory, as well as the Crooked Creek White Mountain Research Station for lodging accommodations and hospitality. Our research was supported by the Anadarko

Petroleum Corporation, the UNC Honors Program, the First-Year Seminar Program, and the Office of Undergraduate Research: Graduate Research Consultant Program. We would also like to especially credit Prof. Allen Glazner for his oversight of our project, methods, and field work and Prof. Drew Coleman for his individualized guidance in our strontium analysis. We would like to credit Tyler Wickland for helping us obtain our results with his polishing expertise.

Works Cited

1. Bilodeau, B. J. and Nelson, C. A., 1993, Geology of the Sage Hen Flat Pluton, White Mountains, California: The Geological Society of America, MGI077, 1:24000 Coleman, D.S., Bartley, J.M., Glazner, A.F., and Law, R.D., 2005, Incremental Assembly and Emplacement of Mesozoic Plutons in the Sierra Nevada and White and Inyo Ranges, California: Geological Society of America Field Forum Field Trip Guide (Rethinking the Assembly and Evolution of Plutons: Field Tests and Perspectives, 7-14 October 2005), p. 42.
2. Ernst, W.G. and Hall C.A., 1987, Geology of Mount Barcroft-Blanco Mountain area, eastern California: The Geological Society of America, MCH066, 1:24000.
3. Nelson, C. A., 1966, Geologic map of the Blanco Mountain quadrangle, Inyo and Mono Counties, California: U.S. Geological Survey, GQ-529, 1:62,500
4. Stears, M.S. and Bartley, J.M., 2015, Two-stage emplacement of the McDoyle pluton: insights into the early stages of intrusive suite construction, Sierra Nevada, CA.: The Geological Society of America Bulletin. p. 1-7.



Lizzie Wilson, Jed Hidgon, and Jack Davidson became involved in research through Professor Allen Glazner's First Year Seminar: Geology 72H. The class is centered around a hands-on research trip in Eastern California. Over fall break the class spent a total of seven days in the field conducting research and learning about the diverse geology of the region spanning the Bishop Tuff and beyond. Lizzie, Jed, and Jack worked to decipher two

competing geologic maps in the White Mountains under the guidance of Professor Allen Glazner and Professor Drew Coleman. In California, their work involved mapping a large area by hand and taking samples of rocks. Once back in Chapel Hill, they shifted their focus towards analyzing crystal size and strontium contents of their samples for the purpose of confirming or denying the previous conflicting maps of the region. All three students greatly enjoyed the opportunity to get involved with research so early in their Carolina career.