

African Americans During the Vietnam Era

Name: **Robert Richmond**

ABSTRACT

Racial inequality was being fought in the sixties. That did not stop the racism that still filled the minds of many white Americans. The African American soldier during the Vietnam Era was mistreated and held back from advancing in rank. They were put on the front lines and were forgotten by their leadership.

BACKGROUND OR CONTEXT

In the sixties racial equality was being sought and one man in charge was Dr. Martin Luther King, Jr. Also, the Vietnam War, also known as the Second Indochina War, was just beginning. The draft was enforced and many of those drafted were from poor, lower-class families. The Vietnam War had the most African American soldiers ever to serve in a war.

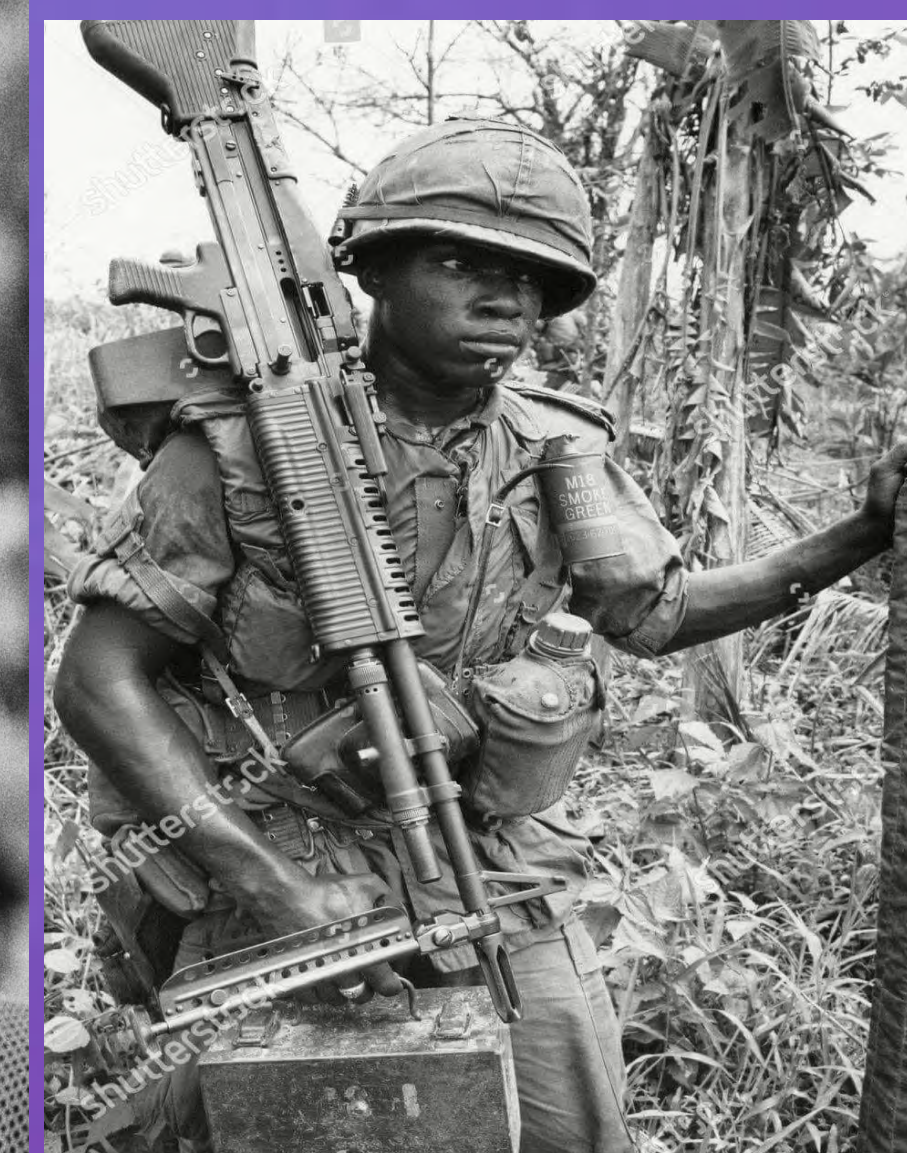
Additionally, by war's end, African Americans represented almost 25% of those killed in action. African American soldiers claimed that they were disproportionately assigned menial duties, denied promotion to the rank they deserved, and unfairly targeted for punishment. L. Howard Bennet, the Deputy Assistant Secretary of Defense for civil rights noted that black soldiers often "Complained that they were discriminated against in promotions". African Americans represented 16.3 percent of all draftees and 23 percent of all combat troops in Vietnam.

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RESULTS / OUTCOMES

I found that African Americans were targeted by the selective service system because they were poor. By studying the Vietnam War it made me realize that racial inequality existed in the 1960's.



Amritsar/Jallianwala Bagh Massacre of 1919

This poster will consider the following questions:

Was this British colonial abuse in India?

Why were civilians massacred?

Was this a case of British racism?

Have the British been held sufficiently accountable for this atrocity?

British Causes/Colonialism

Product of British law

Anarchical and Revolutionary Crimes Act of 1919/Rowlatt Act

Man on the spot principle

Degree of Force/Moral Effect

Indian Causes

Arrest of two Indian leaders

Unsanctioned Protest

Curfew violation



Location: Jallianwala Bagh Garden, Amritsar, Punjab, India

Key Points

Dyer ordered the shooting of Indian civilians

Massacre lasted approx. 10min, 1650 bullets fired; no escape possible

Over three hundred civilians murdered, over 1,000 severely wounded

Meant to teach lesson to Indian population through terrorism/force

No prosecution of Dyer in India, or Great Britain

Court ruled actions justifiable, necessary to quickly stop riot/rebellion

What were the results

Starting point for the end of the British Raj

Mahatma Gandhi's total commitment to Indian independence from Britain

Indian realization for need of separation from the British rule

Sources

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2) *Calculated to strike Terror!: The Amritsar Massacre and Spectacle of Colonial Violence*, by Kim a. Wagner

3) *A Concise History of Modern India*, by B. Metcalf & T. Metcalf

Authorship Abuse and Academic Spam Email: An Investigation into the Complexity of Co-Authorship

Steven Engel and April Johnson

Abstract

Through an analysis of a spam email sent to a professor requesting a chance to have others be added as co-author in exchange for money, this presentation discusses the various academic guidelines for co-authorship and the different types of authorship abuse that are being used today. By bringing awareness to the new fraudulent request techniques, this project aims to make visible the complexity of co-authorship in academic spaces.

Sample Emails of Co-Authorship Fraud

Dear Hyndman, Rob J.

Hope you are doing well.

I write this letter on behalf of authors seeking to co-publish. We have seen your previous works (<https://www.socpus.com/authid/detal.uri?authorId=7006914313&eid=2-s2.0-8506357156>) and they were considered to be of high quality. Therefore, I offer you a co-publishing partnership.

Our clients wish to buy positions in scientific articles that are in line with their research interests. As our partner, you can offer us a position or two in your work. In this way, we develop a network of scientists with whom we would like to partner. We hope you will agree that this type of partnership can be mutually beneficial, and beneficial for authors too!

If you are interested in this, please, let me know. I will forward all required information to you and answer all your questions.

P.S. Sorry for bothering you if you find this letter useless and not interesting.

Respectfully,
Dr. Stutaluk Vladimir

Dear Dr. Jennifer J Griggs JJ,

Greetings from the journal.

We have gone through your huge profile online and it is very fascinating and inspiring. We have successfully completed 5 volumes with good quality articles kindly visit archive at: <https://www.gavinpublishers.com/journals/archive/annals-of-case-reports-issn-2574-7754> and request you to submit your next article to publish in upcoming issue of volume 6.

You can submit your Manuscript online at: <https://gavinpublishers.com/papersubmission> or you can send as an attachment to info@gavinpublishers.org The last date of your Submission is 25th March, 2021.

Note: If you need additional time for article submission, please give a reply to me. We accept all types of case reports. Reviewer Board Member positions available. Hoping for your positive reply!

With kind Regards,
Neva Grey
Journal Manager
Annals of Case Reports (ISSN 2574-7754)
Gavin Publishers Inc.,
5911 Oak Ridge Way,
Lisle, IL 60532, USA
Tel: +1 6303970234

Example of Academic Guidelines

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Typology

Translation-Plagiarism	When a paper is translated into another language and claimed as their own
Gift or Reciprocal	Co-authorship is given as a gift
Honorary	Given sometimes automatically to department heads or given without consent
Paid Co-authorship	When someone seeks an author to pay to be added to a paper or an author offers a co-author spot on their paper for money
Bully	Someone manipulates or intimidates another to be added on the paper
Fraudulent	Claiming authorship of something that the person did not write
Paper Mill/Essay Mill	Typically used by students to pay another to write a paper for them
Pharmaceutical Ghost	Pharmaceutical companies write articles and try to recruit scholars to add to the paper to appear reputable.

Discussion

- ❖ Plagiarism is not just an issue for students
- ❖ The complexity of co-authorship creates opportunities for abuse.
- ❖ No consistency for universal rules required for co-authorship
- ❖ The importance of awareness and the ability to identify online scams and predatory emails

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An Analysis of Passive Blood Spatters from an Injury to the Human Torso

A'Mia Brewer and Dr. Mollie Sorrell

Department of Biology, Defiance College, Defiance, OH

INTRODUCTION

Blood spatter pattern analysis (BPA) is the study of analyzing the shape, size and distribution of blood from an event and is used to determine the cause of bloodshed at crime scenes (Sundarrajan and Pathak, 2012). There are three main groups of blood spatters: transfer, passive and impact. Transfer stains are created when something passes through an existing pool of blood and creates swipes or patterns, such as a handprint or a shoe print. Passive stains are created when gravity acts on the body, creating blood droplets and pools. Impact stains are the result of blood traveling through the air and usually show up as blood spatter (Akin, 2005). Other types of spatter include both arterial and expired spatter (Denison et al., 2011). Each type of spatter has distinct characteristics that allow analysts to determine how they were produced.

Blood is able to hold a spherical shape when traveling through the air due to its high viscosity (Akin, 2005). Inertia allows blood to continue moving along the same path, eventually landing on a surface creating an elliptical or spherical shape (Kittipat et al., 2010). The type of surface that blood lands on can play a significant role in how spherical the spatter drop is.

AIMS AND HYPOTHESIS

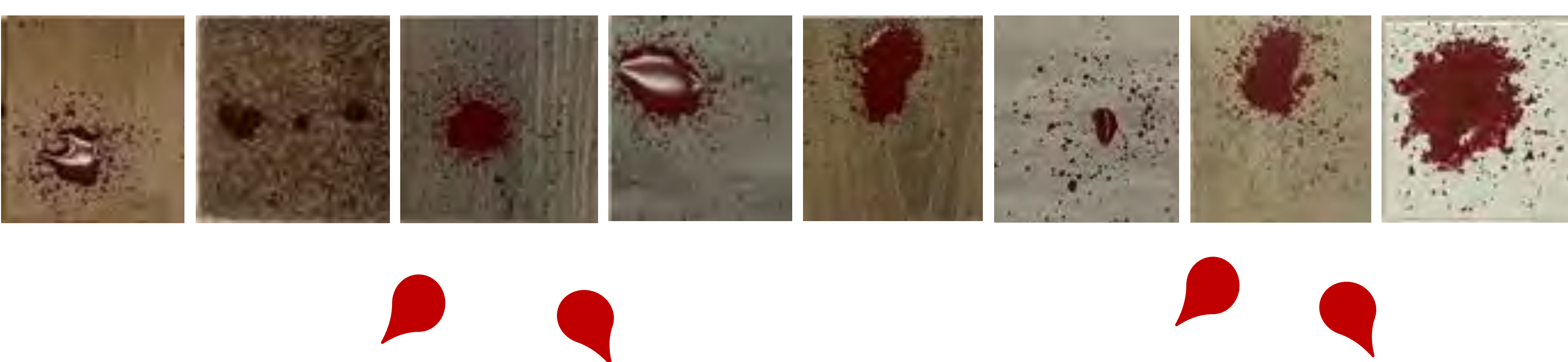
The objective of this research was to identify and analyze passive blood spatter patterns resulting from wounds to a human torso. We expired different volumes of synthetic blood (0.5 mL and 1 mL) from two different distances (three feet and four feet) to mimic a torso injury in an adult male (four feet) and female (three feet), and then examined the blood spatter pattern. In order to determine how flooring can impact the spatter pattern of blood, we performed experiments using eight different types of flooring including: bamboo, carpet, laminate, hickory, oak, maple, porcelain, and ceramic tile.

Hypothesis: The volume of blood, distance of expiration, and flooring surface can impact the blood spatter pattern of passive stains.

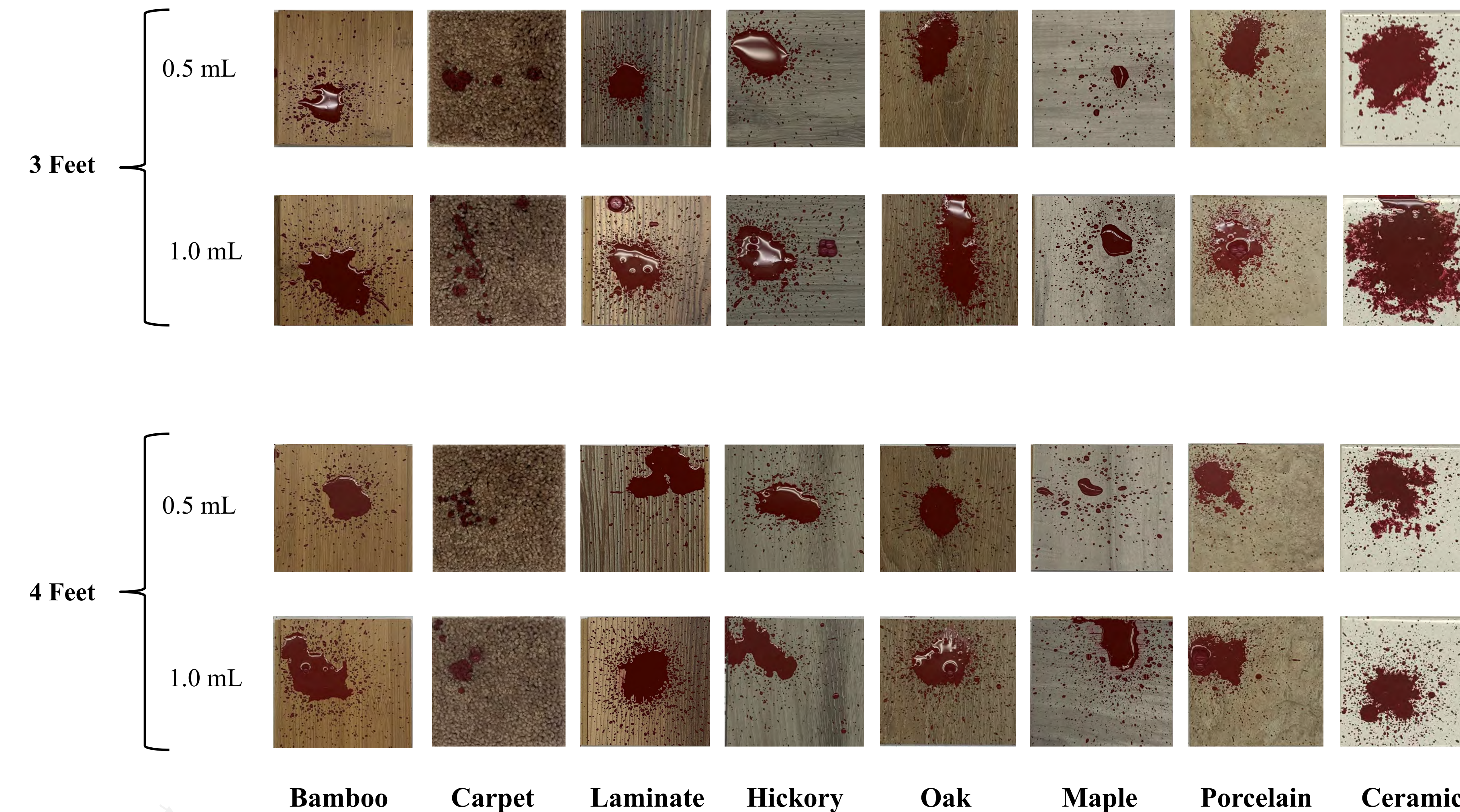
METHODS

We obtained eight different types of flooring samples (four of each) from the local hardware store including: bamboo, carpet, laminate, hickory, oak, maple, porcelain, and ceramic tile. The work area was lined with plastic tablecloths, white paper, and then all eight flooring samples. First, we expired two different volumes of synthetic blood (0.5 mL and 1 mL) three feet above the flooring samples, to mimic a torso injury in an adult female. The blood spatter patterns were photographed and measurements were taken for each flooring sample. Then, the work area was cleaned and re-lined with plastic tablecloths, white paper, and eight new flooring samples. We expired two different volumes of synthetic blood (0.5 mL and 1 mL) four feet above the flooring samples, to mimic a torso injury in an adult male. The blood spatter patterns were photographed and measurements were taken for each flooring sample. Data was then analyzed using the images and measurements taken for each flooring sample to determine the effects of blood volume, distance of expiration, and type of flooring surface on the blood spatter pattern.

A. Experimental Design



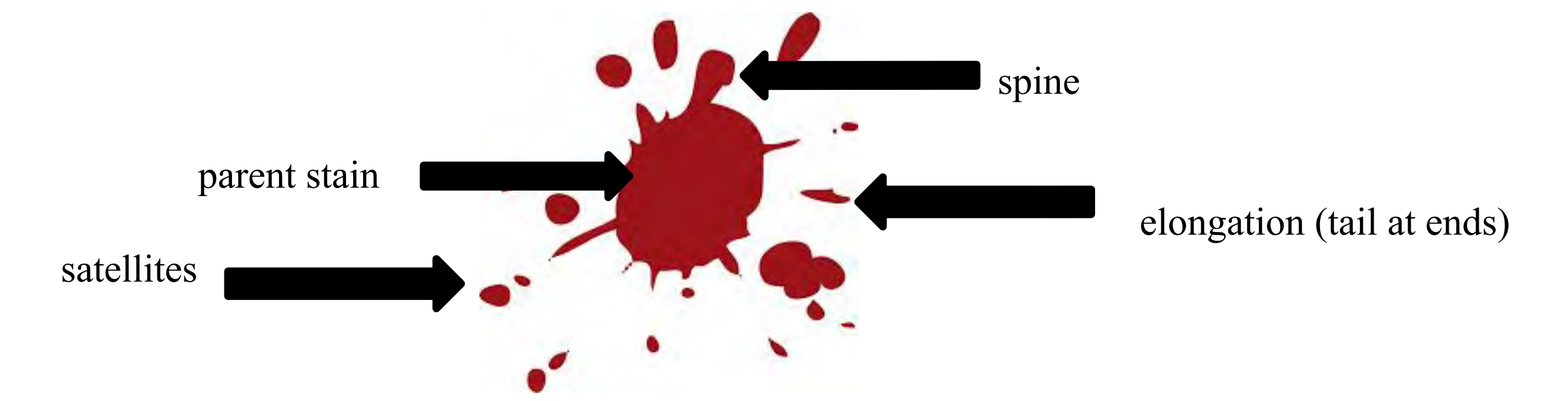
1. Blood Spatter Patterns



OBSERVATIONS

At three feet, all of the spatters created had spines and satellites except for the carpet samples. Bamboo, laminate, hickory, maple, porcelain and ceramic spatters had spherical satellites. Hickory, oak and porcelain had elongated satellites. Hickory and oak included tails on some of the satellites. Other characteristics noted at three feet spatters include: spatters created on carpet were saturated, satellites on the maple samples were further away from the parent stain and the blood spatter spread across the ceramic samples, creating an absorbed like appearance on the tiles.

At four feet, all of the spatters created had spines and satellites except for the carpet samples. Bamboo, laminate, hickory, maple, porcelain and ceramic spatters had spherical satellites. Some of them in bamboo were slightly elongated. Laminate, hickory, oak, porcelain and ceramic had elongated satellites. Tails were apparent in laminate, hickory, oak, porcelain, and ceramic spatters. Other characteristics noted at four feet spatters include; spatters created on carpet were saturated and the blood spatter spread across the ceramic samples, creating an absorbed like appearance on the tiles. Also, the amount of tails coming from satellites increased in the 1 mL stain.



SUMMARY

Results indicate that flooring type has an impact on the characteristics of spatter patterns created with both volumes of blood. The diameter of every parent stain increased as the volume of blood expired increased. However, the diameter decreased as the distance of expiration increased. This could be because the amount of satellites increased at four feet, making the parent cell smaller.

Similar characteristics were observed between all of the spatters created. These passive stains possessed spherical and few elongated satellites, spines coming from all of the parent stains except for carpet, and few tails coming from some elongated satellites. The blood spatter on the carpet samples were saturated, possessing no spines, satellites or tails. The ceramic tile caused the blood to spread across the sample when it came in contact with it. This created large spatters with fewer satellites. Errors include a few drops of blood missing the sample when expired, blood spatter disturbed when transferred off the floor to the table and inconsistent force during all expirations.

The volume of blood, distance of expiration and flooring surface does impact the characteristics of passive blood spatters.

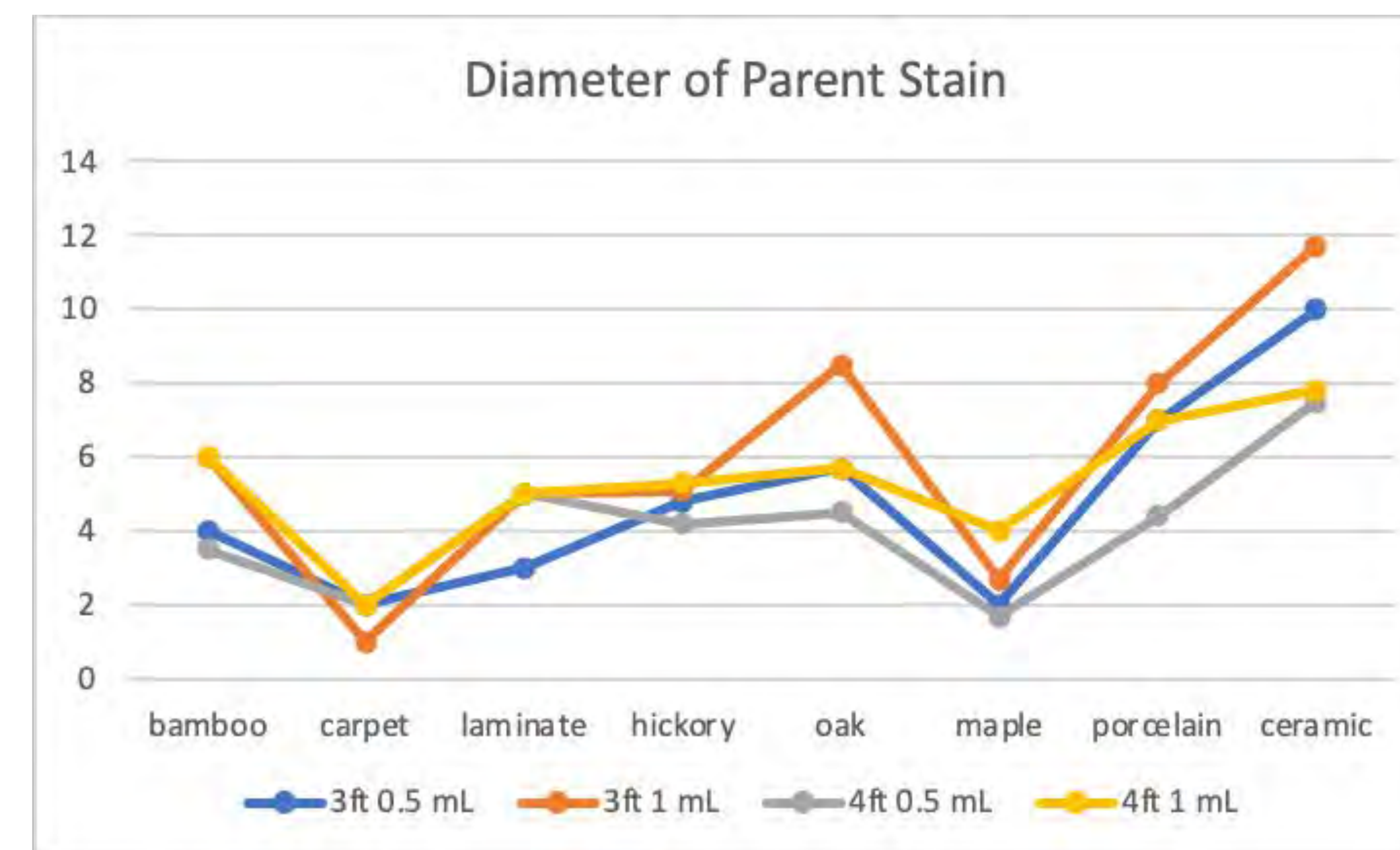
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ACKNOWLEDGEMENTS

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Results



The diameter of the parent stain was measured in centimeters and plotted on graph above.

Average diameters:
3 ft 0.5 mL is 4.8 cm 3 ft 1 mL is 6 cm
4 ft 0.5 mL is 4.1 cm 4 ft 1 mL is 5.35 cm

Positive correlation between diameter of parent stain and volume of blood. (Average diameter increased as volume increased)
Negative correlation between diameter of parent stain and distance expelled. (Average diameter decreased as height increased)



Building Relationships through Lines of Communication

Dylan King

Faculty Mentor - Mary Ann Studer



ABSTRACT

Sustainable Development in developing countries is difficult to track because multidimensional conditions in small rural communities are rarely documented. Initially this project was to continue the development of a non-invasive poverty index in order to provide the San Carlos community with information critical for them to self-determine their future. Since Covid-19 made travel impossible this project sought to open lines of communication to document the status of the village now impacted by this pandemic.

METHODOLOGY

Building communication and trust is the true essence of my project. To overcome the lack of face to face interactions due to COVID – 19 ,a variety of communication lines are being created in order for me to build rapport and trust with our community partners. These lines of communication include video / phone calls and where possible private social media accounts wherein information can be shared. These connections will help provide data on how the village of San Carlos is handling the pandemic and the effects it has had on the village. These conversations will serve as a point-in-time reference for the village as they further develop and inform future McMaster projects based on the challenges, both old and new, that this community faces. Gaining a clear understanding, albeit from a distance, of the impact of the coronavirus has had on this village is critical for effective collaboration moving forward.

CONTEXT

A point-in-time reference is crucial not only in the current context but it is foundational to charting future development. The Non-Invasive Poverty Index (NIPI), as originally proposed for this project, would have provided point-in-time data that could be aligned with multidimensional parameters useful for assessing levels of poverty as defined for sub-groups of people.(Alkire, 2014). Not being on-site to perform the NIPI and have face-to-face interactions, it is important that relationships with our community partners are still nurtured. Maintaining these relationships will allow for this project to effectively conduct a SWOT analysis with the village residents when we are once again on site. The SWOT analysis will give villagers a written record of where they are currently and provide self-determined direction for their future development. This analysis will also provide motivation for the community as they focus on their strengths to address their challenges. Both the NIPI and the SWOT analyses are vital to the development of San Carlos. Working to create and maintain lines of communication even through this pandemic is critical for building relationships that will be foundational to the effective implementation of the NIPI and the SWOT analyses once the team is on-site again in Belize.

OUTCOMES

The project will develop the lines of communication needed in order to (1) discuss how the current projects of this year's team can be effectively implemented; (2) gauge the impact that the pandemic has had on our community partners and document the point-in-time conditions in wake of this crisis; and (3) discuss the direction of future projects with our community partners based on their needs and challenges.

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Strengths:

Anything that is of value and aids in the success of a group or individual.

Weakness:

Things that are not beneficial to the individual or group.

Opportunities:

Ideas or situations that could positively impact the group or individual.

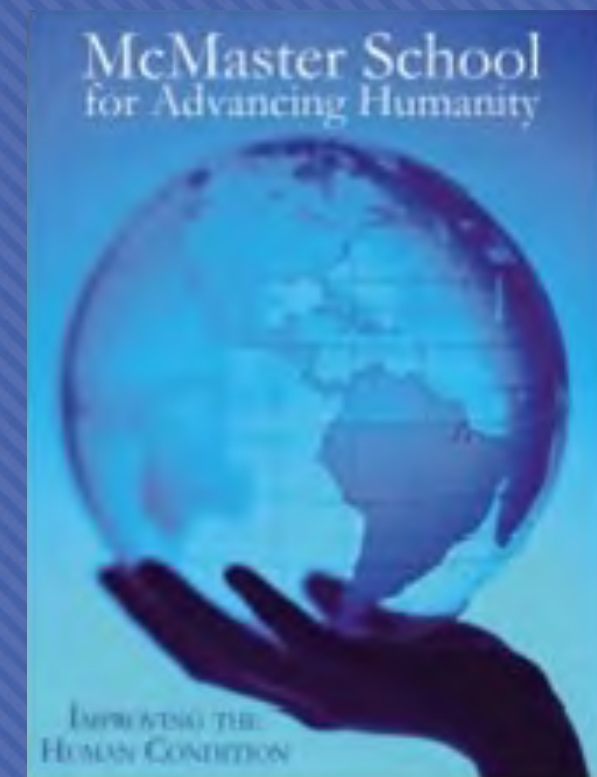
Threats:

Any potential danger to the well-being of the group or individual.

Classroom Inclusivity Through Agriculture Themed Content

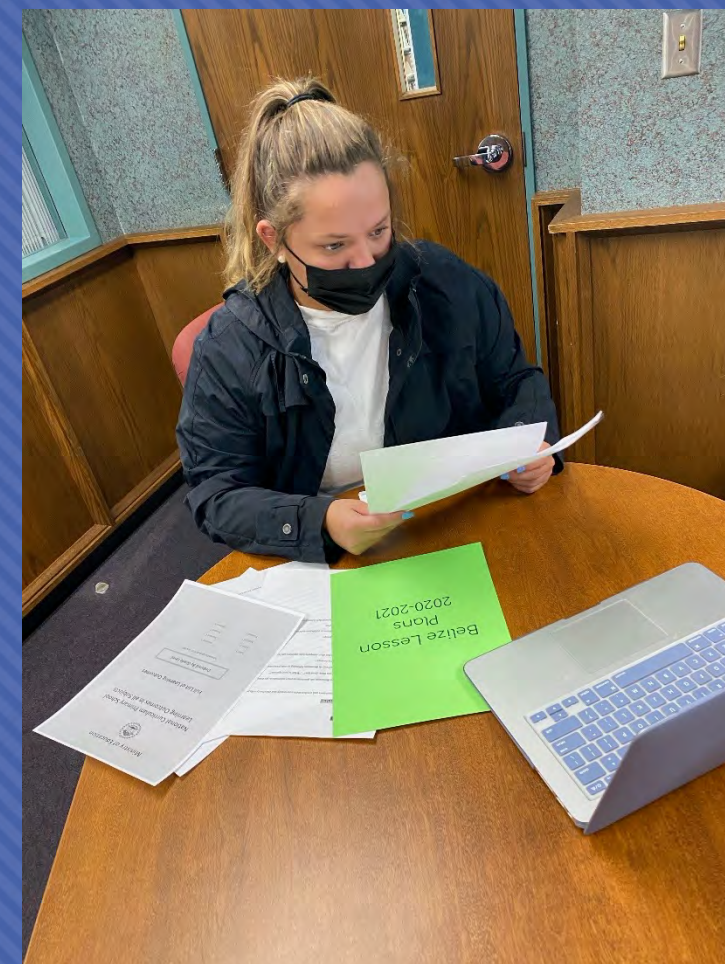
Kelsie Shafer

Faculty Mentor: Mary Ann Studer



ABSTRACT

This project addresses the lack of resources and content available to support agriculture themed lessons in primary education, articulated by teachers, administrators and ministry officials when I was in Belize in 2019. In response to these requests, I created agriculture-based lesson plans incorporating UDL (Universal Design for Learning); making the lessons accessible to students at different education levels. These lessons and materials will be sent to our community partners due to current travel restrictions.



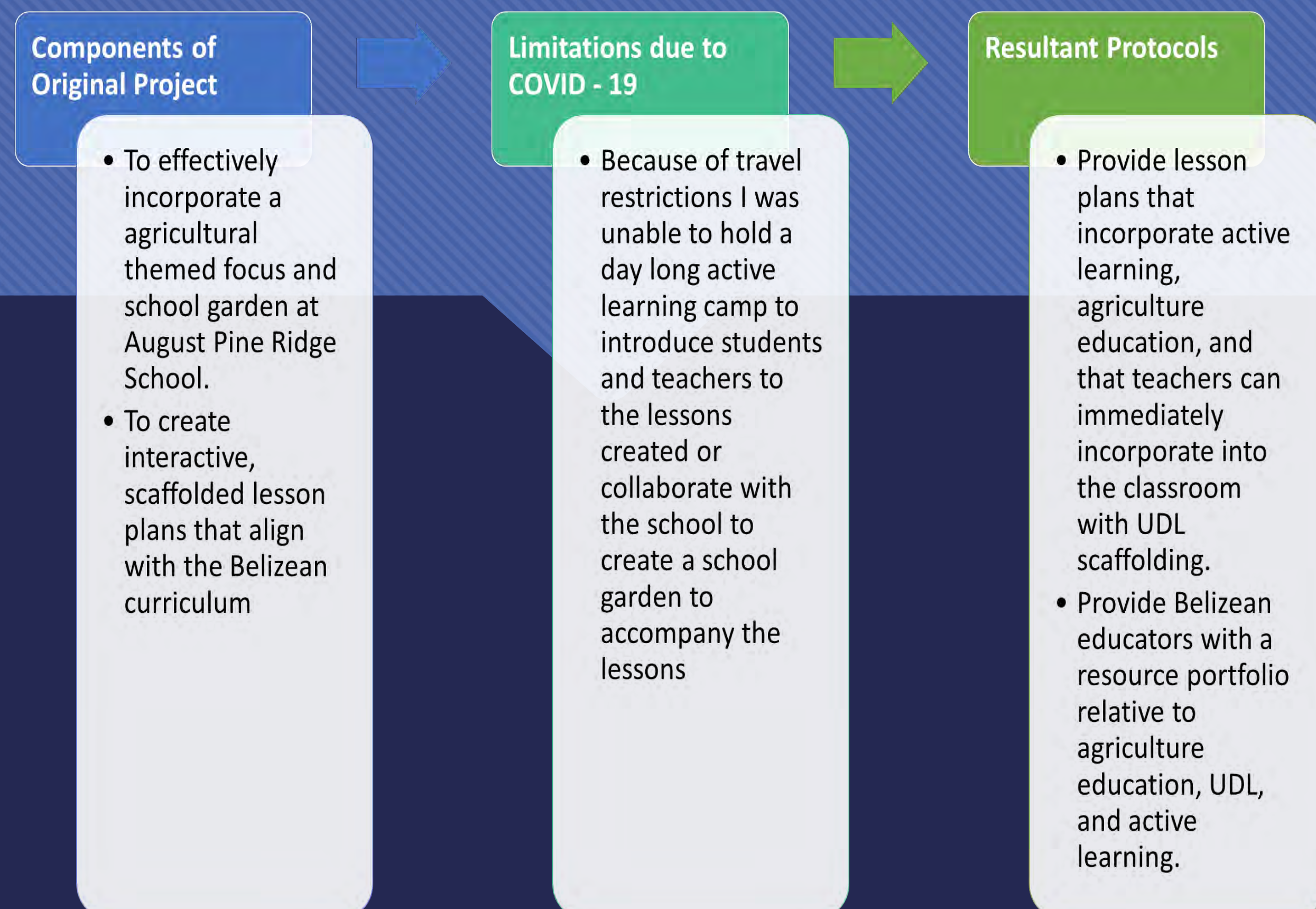
BACKGROUND

The village of August Pine Ridge has not been identified as an agricultural community for multiple generations (Studer). However, the village is in a primarily rural area in the Orange Walk District with villages such as Yo Creek and Trinidad neighboring. Because of the location of August Pine Ridge, getting back to prior practices such as farming would help to ensure that the 400-primary school-aged children in the village have access to fresh fruits and vegetables. Therefore, to address the problem of lack of resources, I created interactive agriculture-based lesson plans. To meet the needs of all learners in the general primary education classroom, the agriculture lesson plans will include Universal Design for Learning (UDL) strategies. The goal of UDL is to provide a framework designed for all learners thus eliminating potential barriers for students with varying abilities (Ralabate, 2016). This is especially important in Belize because students with learning challenges are most often mainstreamed into tradition classroom settings that lack support for their needs. The UDL principles offer the educator multiple options for how students can engage in learning, receive information and respond or demonstrate their knowledge and skills (Ralabate, 2016).

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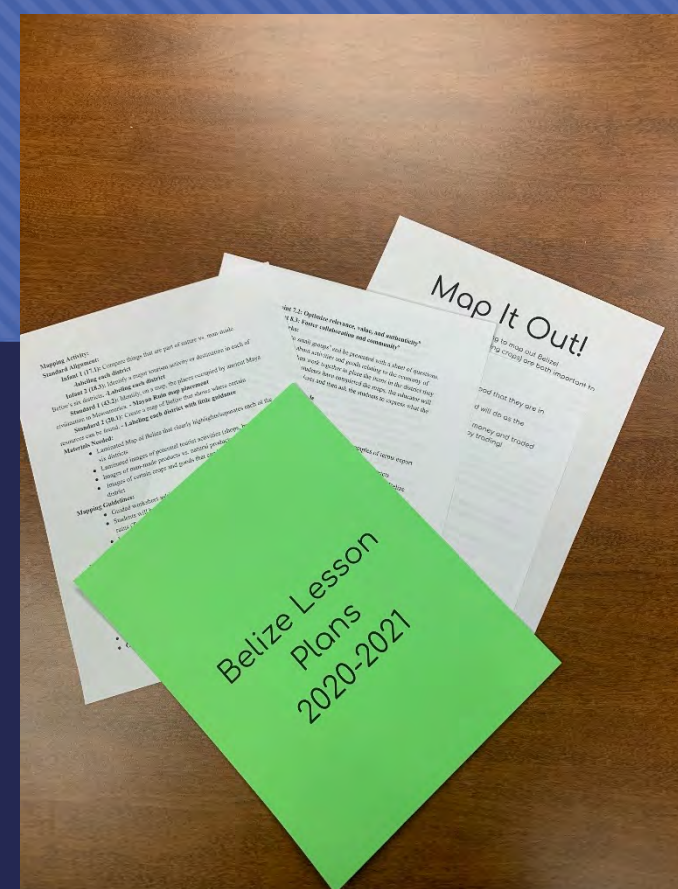
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METHODOLOGY



OUTCOMES

The outcome of my project is to create interactive lesson plans within the Belizean common core spectrum that align with agricultural themes. I created lesson plans for each grade level (standards) for the educators at August Pine Ridge School. The framework of each of these lessons includes the principles of Universal Design for Learning (UDL). By utilizing lessons that incorporate UDL, teachers can effectively facilitate student learning at all levels of ability. This project addresses two specific challenges expressed by our community partners by (1) providing lesson plans aligned with Belizean standards that incorporate UDL strategies and the proven pedagogy - active learning; and (2) utilizing agriculture themed lessons that cross various grade levels to improve access to fresh produce.



Improving Emergency Response Capabilities in Rural Belize

Scholar: Lucas Thomeier

Fellow: Dean Mary Ann Studer

ABSTRACT

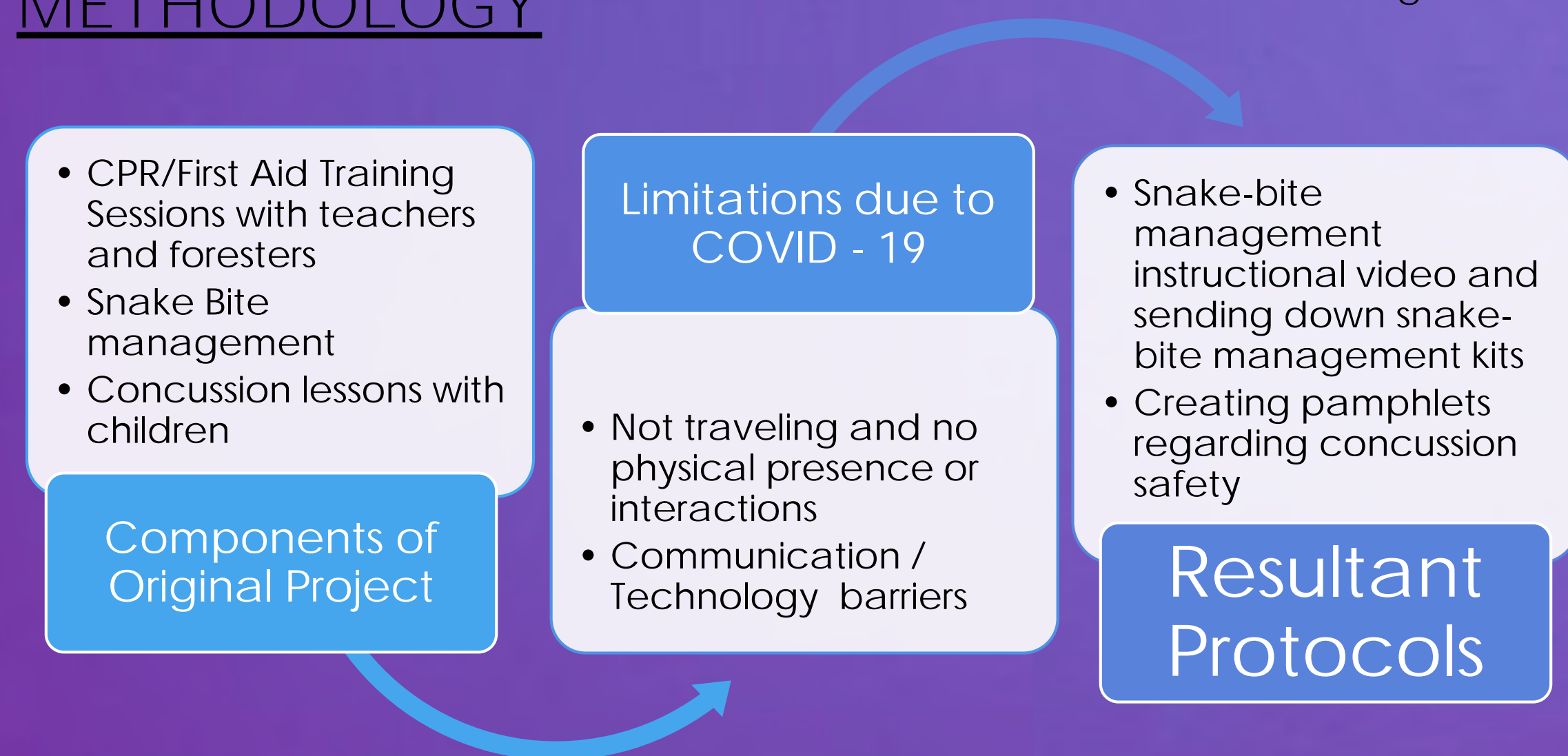
As a second year McMaster Scholar, I will be presenting an overview of the emergency response training this project facilitates with communities in rural Belize. The training focuses on snake bite management and improving concussion awareness. This project will improve the emergency response capabilities of teachers and children at August Pine Ridge and San Carlos schools and Programme for Belize foresters and rangers allowing them to be effective in urgent situations.

BACKGROUND

Emergency Response is critical in rural areas of developing countries like Belize where access to emergency care is literally hours away. This project will provide snake bite management training and concussion information to improve the effectiveness of immediate unskilled response until professional medical care can be accessed. The Programme for Belize foresters and rangers are frequently in the jungle. According to the Cleveland Clinic, up to 95% of snake bites occur in either tropical or developing countries (2020). It is also common in poor communities in rural areas where agricultural workers, herders, fishermen, and hunters are all at higher risk (Cleveland Clinic, 2020). These are the specific areas in which the McMaster team works in Belize. In a recent study, **"People** living in rural areas have a higher risk of encountering snakebites than people living in urban **areas"** (Avau et. al., 2016). Therefore, the snake bite management kits and training provided by this project will be extremely beneficial for villagers and the Programme for Belize.

The second component of my project works to improve concussion awareness. Concussion research has been grown since the start of the twenty-first century, however this information is new to the rural populations we work with in Belize. According to the Mayo Clinic, **"a** concussion is a traumatic brain injury that affects your brain **function"** (2019). The Office of Public Affairs says that concussions are more common in children and falls were the leading cause of traumatic brain injuries among children, accounting for 40% of all brain injuries among them (Office of Public Affairs, 2016). During the trip last year, noticing that the kids play soccer and drive motorcycles without helmets on bumpy roads suggests a higher chance of them hitting their head and suffering a concussion. Since teachers are with them daily throughout the week, noticing and treating concussions will help children retain and learn better in school. It is important that we continue to raise awareness about the dangers of concussions in these communities.

METHODOLOGY



PROJECT OUTCOME

The outcome of this project provides mechanisms for the communities of San Carlos and August Pine Ridge, as well as the staff of Programme for Belize to obtain the knowledge necessary to provide immediate effective response to venomous snake bites and potentially threatening concussions. These mechanisms include the following: snake bite management kits and accompanying training video; and pamphlets about concussions awareness and response. Although further CPR and first aid training is still needed this project will serve as an immediately critical bridge to information until we can be on site in Belize to do further emergency response training.

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Family Structure in Belize

Logan Gray, McMaster Research Assistant

Faculty Mentor: Mary Ann Studer

Abstract

As a McMaster Research Assistant to the Belize Learning Community, I conducted research about the structure of Belizean families in both social and cultural contexts. There are many current challenges Belizeans face within their communities. Some of these issues that past and current teams have worked to address include improving the welfare of women and children, facilitating economic development, and raising awareness of domestic violence. While conducting my research, I learned about the different roles within the nuclear family as well as how those roles change through interactions with extended family. With a clearer understanding of Belizean family structure, McMaster teams can more effectively collaborate to address the challenges these families face while still being sensitive to the cultural traditions and social context that exists within these communities. My research provided a critical background for moving forward toward appropriate solutions to improve the lives of families in Belize.



Background

Belize is located in Central America and has a diverse population comprised of various cultures and languages. The McMaster initiative specifically works with the small rural communities in Belize. Even though the official language in Belize is English (a remnant of British colonialism), many different languages are spoken in various parts of the country. The Belize culture is a mix of Kriol, Maya, Garinagu, Mestizo, and Mennonites. To better understand how the family structure works in these rural areas, it is important to look at the different roles of women, and men. Women often become single moms at a very young age. If work is available single mothers work outside the home while extended family members such as grandparents care for the children. In the case of women with a domestic partner (married or not) the women generally stay home and take care of the children and the house while the men work. Access to money is usually controlled by the men in the household.

Children make up at least one-third of the population in Belize. Families are often very large and include most of their extended family. This is very different than in the United States where children are looked after by their nuclear family and access to children care is readily available. In Belize it is common for women to live with their parents until they either get married or have children. Most women only complete primary school. The amount of freedom the women experience is different depending on the culture. For example in Kriol culture it is normal to see single parent families as well as households of independent women living together.

The roles within families may be changing however in areas where work is available and or where access to education beyond primary school is the norm. Currently such role changes seem to only be happening in urban areas in which younger women tend to work outside the home more than older women. It remains for the majority of the population however that the men take the leading roles within the household and that care for house and family continues to be the priority of women.

Conclusion

When looking at the challenges Belizeans face with domestic violence towards women and children family structure is an important factor. If a woman who lives in a small rural community is being abused by her husband it could be difficult for her to speak out about it. If it is a small community than everyone is considered family which makes it even harder to have a secure support system. If it is a small community with no access to education beyond primary school. If it is a small rural community with no means for a woman to gain employment or transportation to job. Limiting women's education, access to economic resources, and tight knot communities could all contribute to secreted domestic violence and no way out. Understanding the family structure in Belize contributes to all McMaster tams moving forward in in particular to my proposed project as a scholar – to empower women and raise awareness of factors that contribute to domestic violence.

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INTRODUCTION

Tylenol, Aspirin and Benadryl are some of the most common over-the-counter prescriptions that humans use throughout their lifetime. It is not uncommon for veterinarians to prescribe over-the-counter drugs to animals for the treatment of illnesses. However, previous studies have shown that over-the-counter or non-prescription drugs can be toxic or have an adverse effect on household pets (Siroka and Svobodova, 2013; Fitzgerald et al., 2006). Acetaminophen (Tylenol) is one of the most widely used drugs in humans, but is also known to be highly toxic to small animals. The toxicity is due to their inability to metabolize the drug. In this study, we will determine if Tylenol, Aspirin and Benadryl are toxic or adversely affect the immune system of crickets. We hypothesized that Aspirin and Tylenol would have more of an effect on the crickets since it is not a drug commonly administered to animals. On the other hand, Benadryl is an over-the-counter drug that humans administer to animals on a regular basis, therefore we hypothesized that Benadryl would not have a huge effect on the crickets.



Fig. 1. Crickets were housed in individual plastic containers with air holes poked into the lids. Experimental crickets were administered medication via cotton balls soaked with diluted Tylenol, Aspirin, or Benadryl. Control crickets were administered cotton balls soaked with water only. Both experimental and control crickets were also provided with laboratory grade dog chow for the duration of the experiment.

OBJECTIVES

- Determine if commonly used over-the-counter drugs such as Tylenol, Aspirin and Benadryl can have an adverse effect or cause toxicity in an animal model.
- The effects of over-the-counter drugs were determined by assessing long-term survival, as well as body mass and hemolymph protein content in adult crickets. Body mass and hemolymph protein content are both indicative of the cricket's overall health and body condition.
- Determine if the effects of Tylenol, Aspirin, and Benadryl were dose-specific by administering various doses of each drug.
- Determine if the effects of drug administration were sex-specific by comparing long-term survival, body mass, and hemolymph protein content in both male and female crickets.

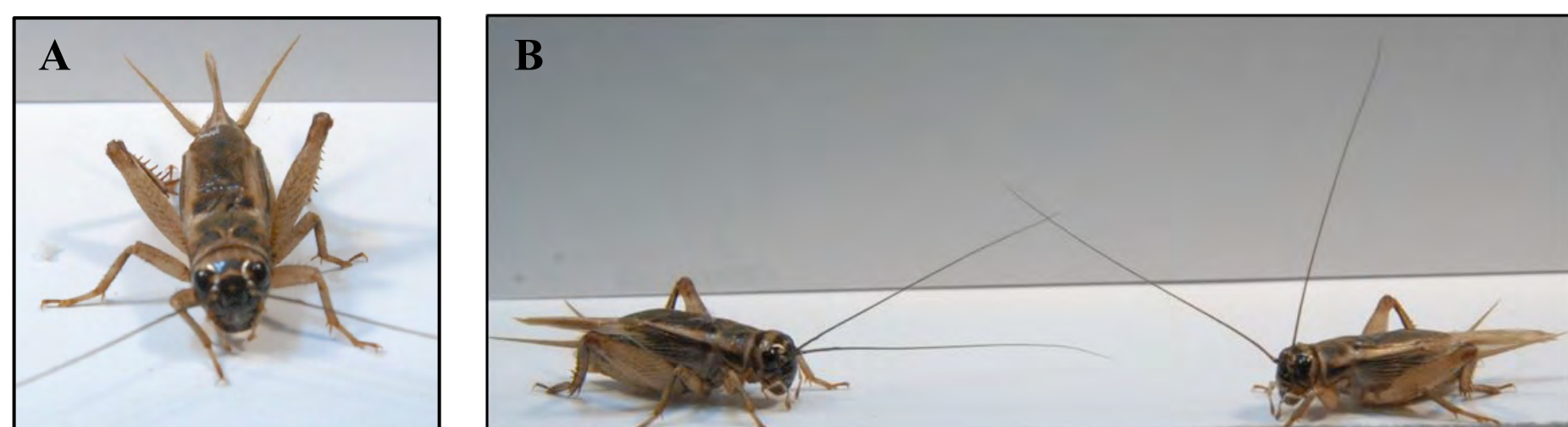


Fig. 2. (A) Day 9 (D9) adult male *Acheta domestica* cricket photographed in an enclosure prior to the start of experiments. (B) Two adult male crickets photographed together in an enclosure prior to the start of experiments.

METHODS

Methodology: In order to determine the effects of over-the-counter drugs on survival and immune function in adult *Acheta domestica* crickets we administered various doses of Benadryl, Tylenol, and Aspirin. Adult male and female crickets were used to determine if the effects of over-the-counter drugs were sex-specific. Adult females tend to be more immunocompetent than males at sexual maturity, which led us to hypothesize that over-the-counter drugs would cause less toxicity in females. Twelve males and twelve females were used for each medication trial. Benadryl was administered to three males and three females for each of the following doses: 25 mg, 50 mg, and 75 mg. Each dose had a control group that consisted of three males and three females that were administered water only. Tylenol was administered as described above at the following doses: 325 mg, 500 mg, and 825 mg. Each of these doses also had a control group consisting of three males and three females that received water. Aspirin was also administered as previously described at the following doses: 81 mg, 325 mg, and 406 mg. The control group included three males and three females that were administered water only. For each medication trial crickets were housed in plastic containers that contained air holes poked into the lids. The drugs were administered through cotton balls soaked in medication that was diluted with water. Both experimental and control crickets were also provided with laboratory grade dog chow for the duration of the experiment. The effects of over-the-counter drugs were determined by assessing long-term survival, body mass, and hemolymph protein content in adult male and female crickets.



Fig. 3. Adult male and female *Acheta domestica* crickets were administered various doses of Benadryl, Aspirin, and Tylenol in order to determine the toxicity and effects of over-the-counter drugs. Benadryl was administered to three males and three females in each of the following doses: 25 mg, 50 mg, and 75 mg. Aspirin was administered at the following doses: 81 mg, 325 mg, and 406 mg. Tylenol was administered at the following doses: 325 mg, 500 mg, and 825 mg.

1. Do Over-the-Counter Drugs Affect the Body Mass of Crickets?

Methodology: The body mass of both experimental and control crickets was determined using a laboratory scale. All crickets were weighed approximately one hour after being administered a dose of medication. Medication was administered by grinding the medication into a fine powder with a mortar and pestle and then suspending the powder into distilled water. A cotton ball was used to absorb the medication and then placed into the cricket's container for administration. The weight of each individual cricket was taken every other day after receiving their medication. The average body mass for each group of crickets was calculated for each day of drug administration.

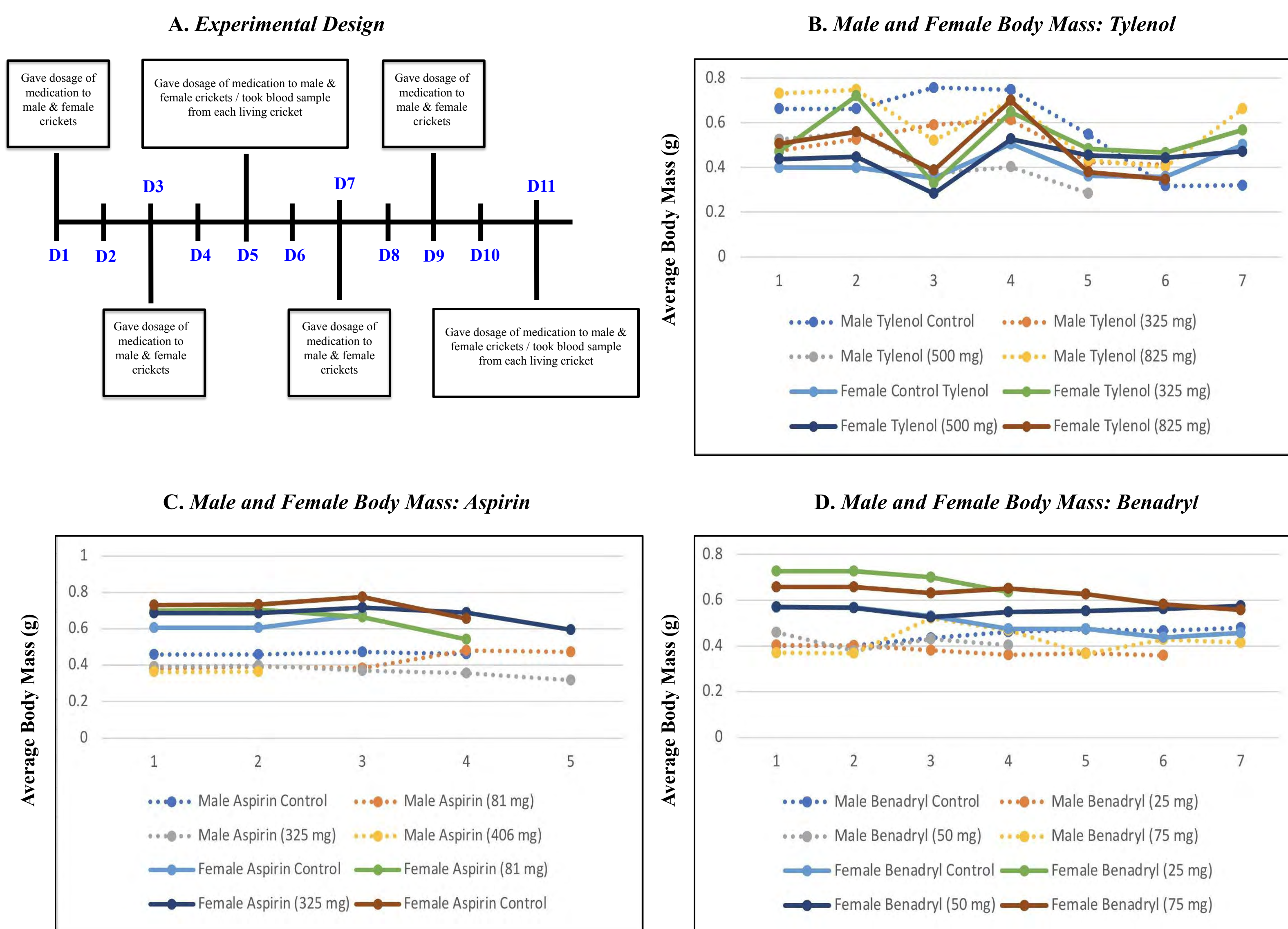


Fig. 4. (A) Experimental timeline depicting the timing of medication administration and blood collection during the project. (B) Average body mass (g) of male and female *Acheta domestica* crickets after administration of Tylenol. (C) Average body mass (g) of male and female *Acheta domestica* crickets after administration of Aspirin. (D) Average body mass (g) of male and female *Acheta domestica* crickets after administration of Benadryl. For all medications and doses, crickets were weighed every other day for the duration of the experiment, for a total of seven weights.

3. Is There an Impact on Hemolymph Protein Content Following Drug Administration?

Methodology: Crickets were administered medication on day 1, 3, 5, 8, 10 and 12 of the study. Blood was collected from surviving crickets on day 5 and 12. Briefly, crickets were anaesthetized by being placed onto ice for 5-7 min, prior to hemolymph removal. A sterile needle was used to puncture the soft tissue between the left pro- and meso-thoracic legs. A 2µL hemolymph sample was removed and dispensed into 98µL of phosphate-buffered saline (PBS, pH 7.4), vortexed briefly, and stored in the -20°C. This 50µL sample was used at a later date to determine the protein content in the hemolymph. The total protein content was determined using a standard Bradford assay. 150µL of PBS was added to each thawed 50µL sample and then vortexed briefly and placed onto ice. All experimental samples were run in duplicate. Duplicate standards of 0, 1, 1.5, 2, 2.5, 5, 10, and 15µg were made by diluting bovine serum albumin (BSA) with PBS into a total volume of 20µL. 250µL of Bradford Reagent was added to each sample before incubating at room temperature for 30 min. The absorbance at 595nm was measured using a spectrophotometer. The absorbances from each duplicate were averaged and this value was divided by the slope of the line generated by the standard curve to determine the protein content of each sample. We accounted for the dilution factor by multiplying the protein content by 10, which gave us our total protein content for each sample.

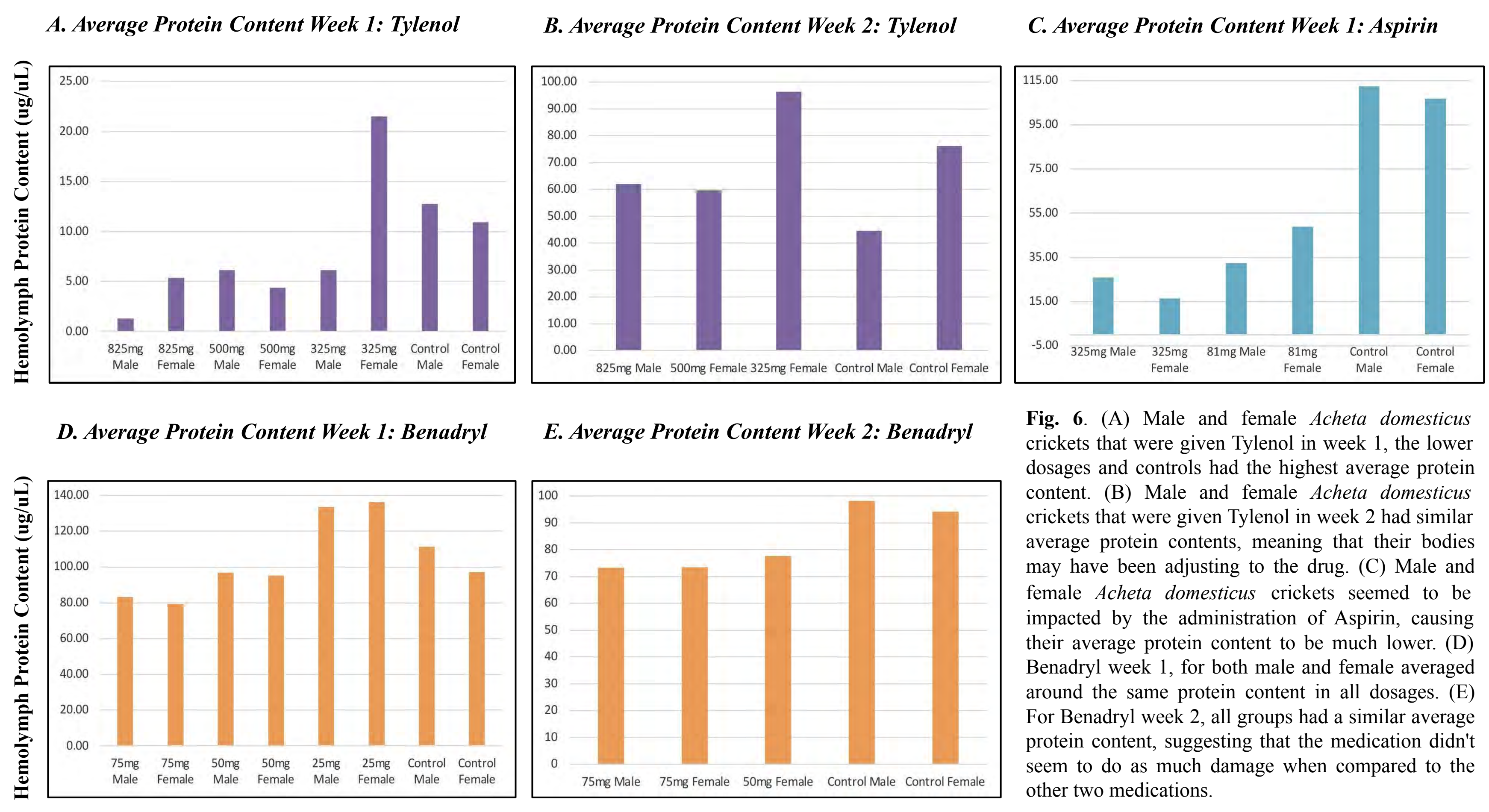


Fig. 6. (A) Male and female *Acheta domestica* crickets that were given Tylenol in week 1, the lower dosages and controls had the highest average protein content. (B) Male and female *Acheta domestica* crickets that were given Tylenol in week 2 had similar average protein contents, meaning that their bodies may have been adjusting to the drug. (C) Male and female *Acheta domestica* crickets seemed to be impacted by the administration of Aspirin, causing their average protein content to be much lower. (D) Benadryl week 1, for both male and female averaged around the same protein content in all dosages. (E) For Benadryl week 2, all groups had a similar average protein content, suggesting that the medication didn't seem to do as much damage when compared to the other two medications.

2. How Do Various Doses of Medication Impact Survival in Crickets?

Methodology: Crickets were checked every other day for survival for the duration of the experiment. Survival was assessed prior to medication administration as well as following medication administration. Dead crickets were recorded and discarded, while surviving crickets were weighed and recorded.

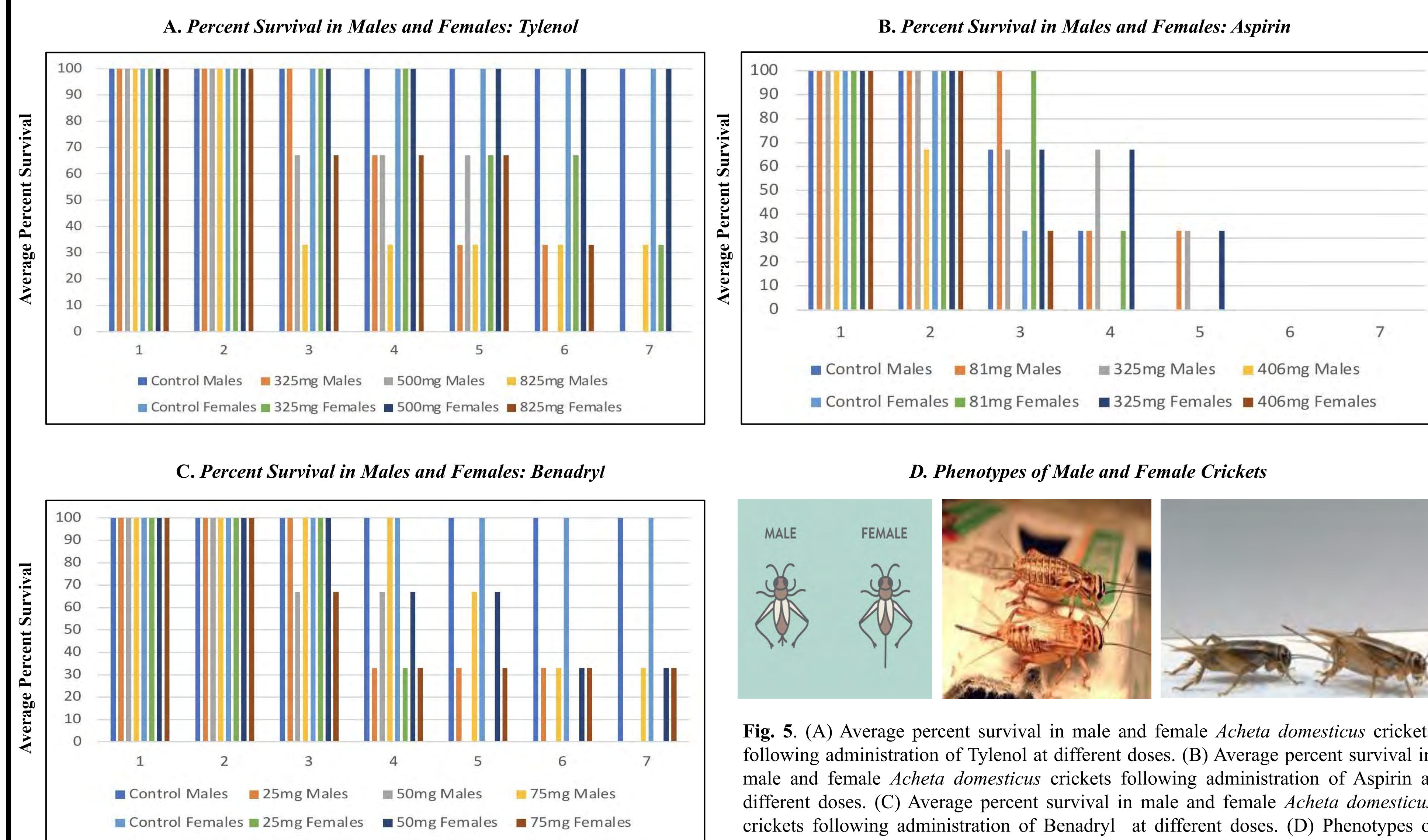


Fig. 5. (A) Average percent survival in male and female *Acheta domestica* crickets following administration of Tylenol at different doses. (B) Average percent survival in male and female *Acheta domestica* crickets following administration of Aspirin at different doses. (C) Average percent survival in male and female *Acheta domestica* crickets following administration of Benadryl at different doses. (D) Phenotypes of male and female crickets that allow them to be distinguished by the human eye. Males have patterned wings and tend to be smaller than females. Female crickets have smooth wings, a long black ovipositor, and tend to be larger than males.

SUMMARY

- The administration of over-the counter drugs had an impact on the body mass, long-term survival, and hemolymph protein content of adult crickets.
- Impact on body mass - During this part of the research both male and female *Acheta domestica* crickets body mass fluctuate up and down. This trial ran dealt with the medication Tylenol and affected both male and female equally, neither one had a distinct difference from each other.
- The higher dosages that were given to the *Acheta domestica* crickets during the three different trials, the less likely they were to survive.
- Aspirin seemed to have the most negative effect on survival, because this trial only lasted one week before all them were no longer surviving. Not one dose had a more negative effect on the *Acheta domestica* crickets in the Aspirin trial, and both male and female were affected the same.
- Females had a higher rate of surviving the medications than males.
- Impact on hemolymph protein content- During the Aspirin medication trial the *Acheta domestica* crickets given the dosages of medication were affected the most. Male and females were affected the same during this trial.
- It has been shown that over-the-counter drugs can be toxic or have a negative impact on household animals.
- In this study we found that Aspirin has a major impact on long-term survival and hemolymph protein content in adult crickets. This suggests that Aspirin may not be an ideal drug to administer to household animals, especially over an extended period of time.

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Improving Access to Credit: Working with an Agricultural Cooperative in Belize

Hayden Clingaman

Faculty Mentor – Mary Ann Studer

ABSTRACT

Farmers in San Carlos, Belize, have trouble accessing low interest credit. I have worked with these farmers to become more financially stable by exploring the potential of establishing a village savings and loan association (VSLA) to help lower interest rates on loans to start their crop year. Basic bookkeeping training that I conducted in 2018 has improved their understanding of profitability and cash flow. In 2019 I conducted an assessment to determine whether a VSLA would be feasible in San Carlos. As a result of this work, the farmers have started a cooperative. This is the first step to lower credit either collectively through traditional credit sources or by potentially establishing a VSLA in San Carlos.

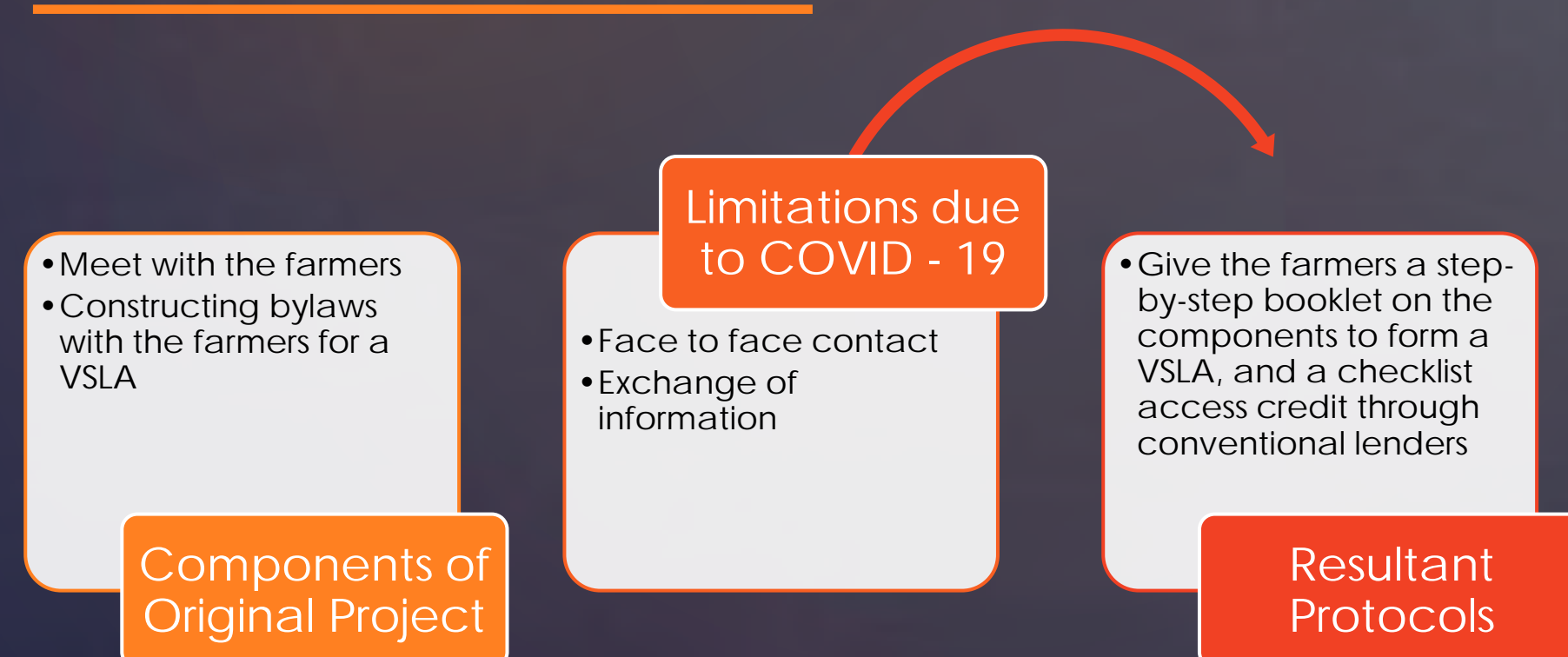
BACKGROUND

The farmers in San Carlos formed the San Carlos Village Agricultural Cooperative in an attempt to secure lower interest rates either as a collective approaching conventional lenders or by forming a village savings and loan association (VSLA) (International Rescue Committee, 2012). Based on an assessment I conducted with three representatives of this cooperative in 2019, we have the following information. San Carlos' infrastructure is stable with access to potable water and improved roads; the village is comprised of close relatives (only five major family names); the village can access a public market in Orange Walk to sell their produce; the close-knit community is tied to family relationships and has a strong commitment to faith; alcohol is barred from the community and the focus remains on community driven values. All of these help contribute to the accountability of all involved in the VSLA and reflect the potential for a VSLA to be successful in this context.

RESULTS

I will contact one or more of the farmers from the San Carlos Agricultural Cooperative via phone to see how the group has managed over the last year. Once understanding their needs, I will create booklets that provide more bookkeeping information as well as real world examples of application. I will provide the farmers with a template that will allow them to build their own by-laws for an emerging VSLA, and a draft of a VSLA constitution specific to the cooperative. Additionally, I will supply them with a checklist of documents required for accessing credit from conventional lenders. As a documented cooperative there is a potential for them to access lower credit rates until the VSLA has accumulated capital for lending. Finally, I will provide them with information based on my research of best practice, that will help them strengthen the cooperative moving forward.

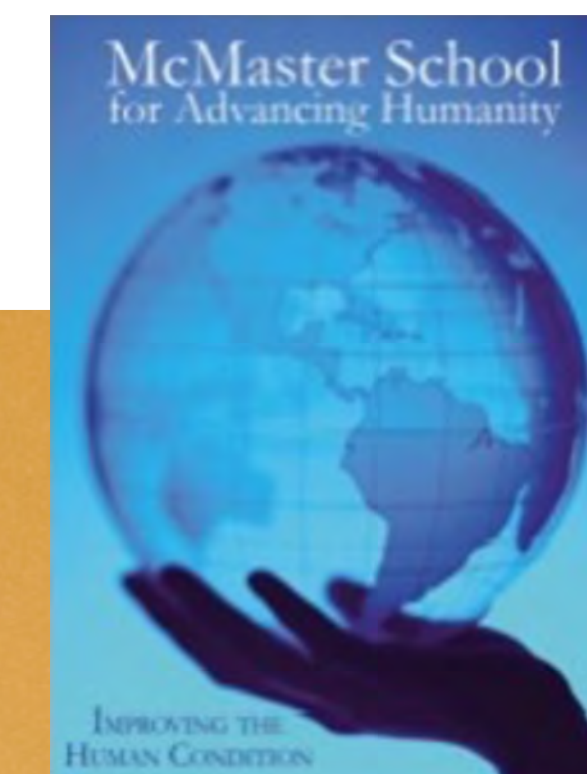
METHODOLOGY



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Improving Pre-School Effectiveness in Belize

Sophie Moller

Faculty Mentor - Mary Ann Studer

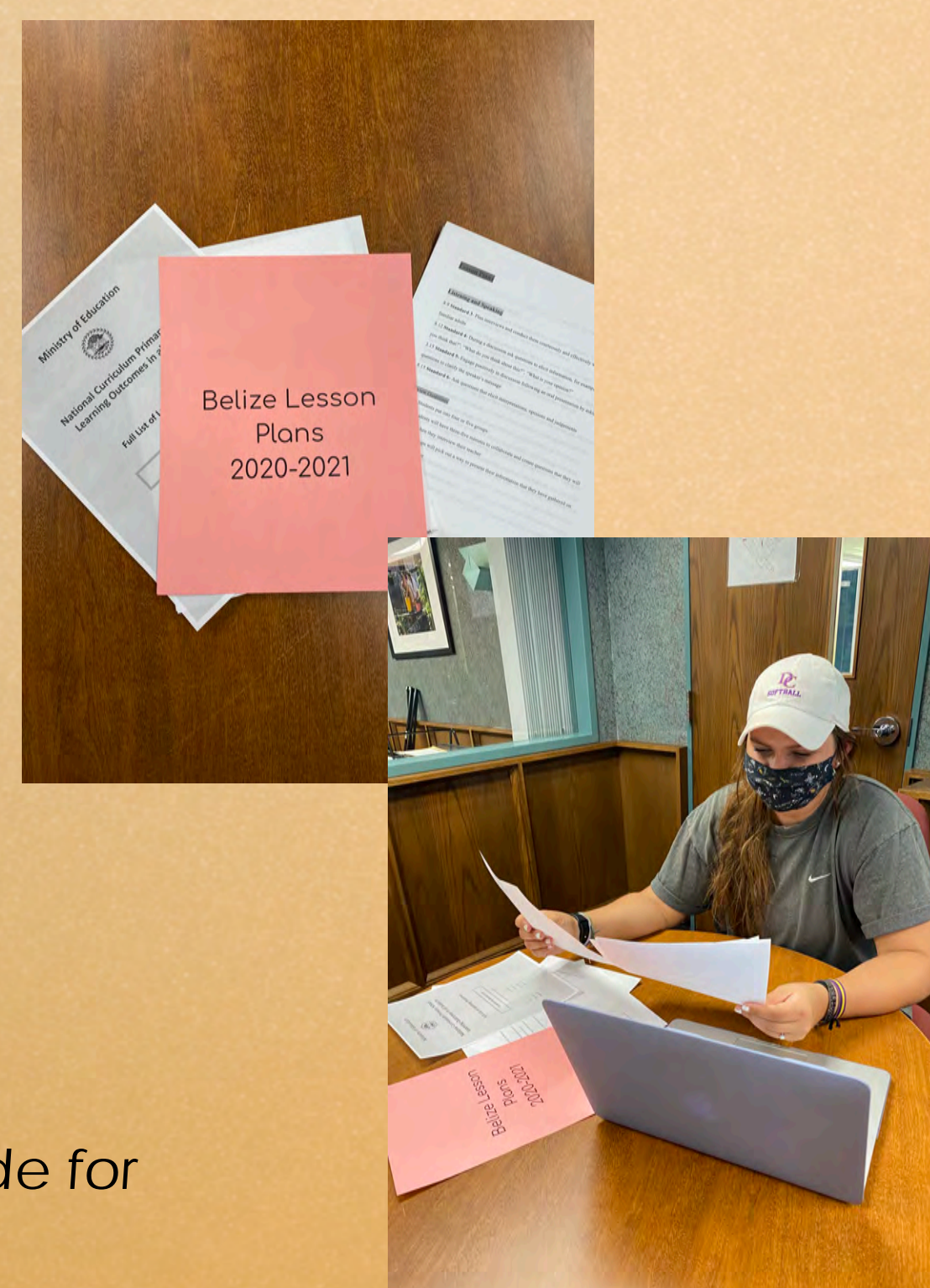
ABSTRACT- THIS PROJECT CONTINUES THE MCMASTER SCHOOL'S SUPPORT FOR THE EFFECTIVE PRE-SCHOOL EDUCATION IN RURAL BELIZE. I DESIGNED EXERCISES AND INTERVENTIONS THAT SUPPORT STUDENTS' FINE MOTOR AND PHONEMIC SKILL DEVELOPMENT AND CREATED LESSONS TO INCREASE STUDENTS' KNOWLEDGE ABOUT NUTRITION. THESE ARE FOR THE INTENDED TO SUPPORT THE PRESCHOOL TEACHERS AT SAN CARLOS AND AUGUST PINE RIDGE SCHOOLS. THE LESSONS WERE INTENTIONALLY CREATED SO THAT THEY COULD BE SUSTAINABLY IMPLEMENTED WITH AVAILABLE, ALTHOUGH LIMITED, RESOURCES. THESE LESSONS AND INTERVENTIONS INCORPORATE UDL AS A CONTINUATION OF TEACHER TRAINING THAT HAS BEEN COMPLETED IN PAST YEARS BY THE MCMASTER TEAMS. THIS PROJECT PROVIDES A FOUNDATION FOR STUDENTS' LONG-TERM SUCCESS.

CONTEXT Preschool is a very important time in a developing child. Preschool is where the child develops and works on his or her fine motor skills and where she develops and understanding of phonics. Being able to work with children on these things is crucial. The McMaster School for Advancing Humanity has been working with preschools in Belize for eight years now and it is important to keep the connection with them. In order to do this and help the preschools be successful, it is necessary that the McMaster school provides them with training materials to help the development of the growing child. Providing the preschool teachers with evidence-based practice relative to fine motor skills, phonics, and nutrition would greatly improve the well-being of the students and the communities. Universal Design for Learning, UDL, will also be implemented in these as there has been a push for it greatly in the Orange Walk District and this will provide training for the teachers on how to implement it into their own lessons.

OUTCOMES - I have created a resource binder for the teachers of the preschools in San Carlos and August Pine Ridge that have explanations of the sustainable interventions and how they will address the developments that they want to work on. These resource binders will have explanations for all of the interventions and how they are to be implemented into the schools so that the teachers will have a full understanding of them.

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METHODOLOGY

- Design and model exercises and interventions for fine motor, phonemic, and nutritional development for the preschool teachers for San Carlos and August Pine Ridge to facilitate implementation

Components of Original Project

Limitations due to COVID - 19

- Due to the pandemic, the McMaster School decided that it was in the best interest of everyone not to travel.

- To create sustainable interventions for fine motor, phonemic, and nutritional development lessons that are compatible with Belizean life that can be sent to the teachers

Resultant Protocols

How Repetitive Head Trauma Affects the Movement and Learning Ability of Mice

Jack Powell and Dr. Mollie Sorrell

Department of Biology, Defiance College, Defiance, OH

INTRODUCTION

Brain damage from traumatic injury has become a significant concern in the United States as more data is collected and problems such as memory loss, seizures, paralysis, and death continue to be studied (9). The new information that has been discovered has led to more regulations on sports as well as safety protocols to help protect everyone (7). These studies surrounding traumatic brain injury have provided valuable insight into ways to help prevent or repair damage. One way to gain insight into traumatic brain injury is to perform experiments using mice, because their brain reacts similarly to human brains when exposed to a traumatic injury (2). This means that drugs that slow, stop, or revert brain atrophy in mice have the potential to be helpful in humans as well. In a previous study, researchers found that two drugs helped to slightly decrease the size of a necrotic core in the brain (1). In another study, researchers were able to prevent chronic cognitive and imaging deficits in the prefrontal cortex from occurring in neonatal rats (8). Traumatic brain injury can not only have short-term effects on the brain but long-term effects as well. It can lead to neurodegenerative diseases such as Parkinson's and Alzheimer's disease (5). Another long-term effect is the ability to learn. It can slow down how fast certain concepts are remembered or understood (10). Mood changes are also a long-term effect of brain injury. Traumatic injury has also been shown to change the brain's electromagnetic waves, which contribute to your mental activity, concentration, sleep, and ability to stay calm (3).

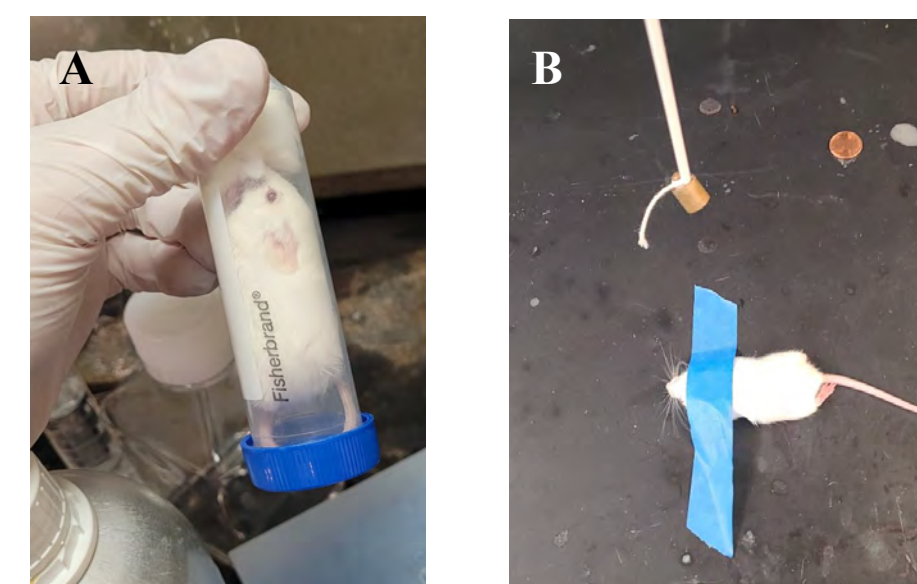


Fig. 1. (A) This image shows the tube that mice were placed into in order to administer the sedative. This ensured that mice were anaesthetized and immobile while being hit with the weight. (B) This image shows the method used to administer a traumatic brain injury to the mice during the experiment.

EXPERIMENTAL DESIGN

In order to properly sedate the mice they were placed in an endorphin tube where 2% isoflurane propylene glycol solution (11) was made to produce the desired level of sedation for the experiment. The mice were then moved to a stage to secure the head and a dime was taped to the top of the head to disperse the force over the entire skull. A weight of 10 grams was dropped from a height of 10 cm to strike the dime (12). The mice were then placed back in their cage to wake up and acclimate back to their environment. There were 2 groups (Group 1 and Group 2) with 6 mice in each group. These 6 mice were split into 3 control mice and 3 experimental mice for each group. The experimental mice in Group 1 were hit with the weight 3 times per week and the experimental mice in Group 2 were hit with the weight 5 times per week.

	Monday	Tuesday	Wednesday	Thursday	Friday
Group 1	Group 1: Run Neuro Experimental: Hit	Group 1: Run Balance and Light	Group 1: Run Water Experimental: Hit	Group 1: Weighed	Experimental: Hit
Group 2	Experimental: Hit	Group 2: Run Neuro Experimental: Hit	Group 2: Run Balance and Light Experimental: Hit	Group 2: Run Water Experimental: Hit	Group 2: Weighed Experimental: Hit

Fig. 2. Experimental Timeline. Group 1 mice were tested in the Fall of 2020 for a total of 4 weeks. Experimental mice in this group were hit 3 days per week. Group 2 mice were tested in the Spring of 2021 for a total of 4 weeks. Experimental mice in this group were hit 5 days per week.

1. Balance Beam Results

Methodology: A balance beam test was used to assess motor balance and coordination in control and experimental mice. Mice were placed onto a narrow beam of wood extending from a ledge, and a bright light was shone towards them. Performance on the beam was quantified by the amount of time it took for the mice to traverse the beam. This test allowed us to detect subtle deficits in motor skills and balance by noting any abnormal movements.

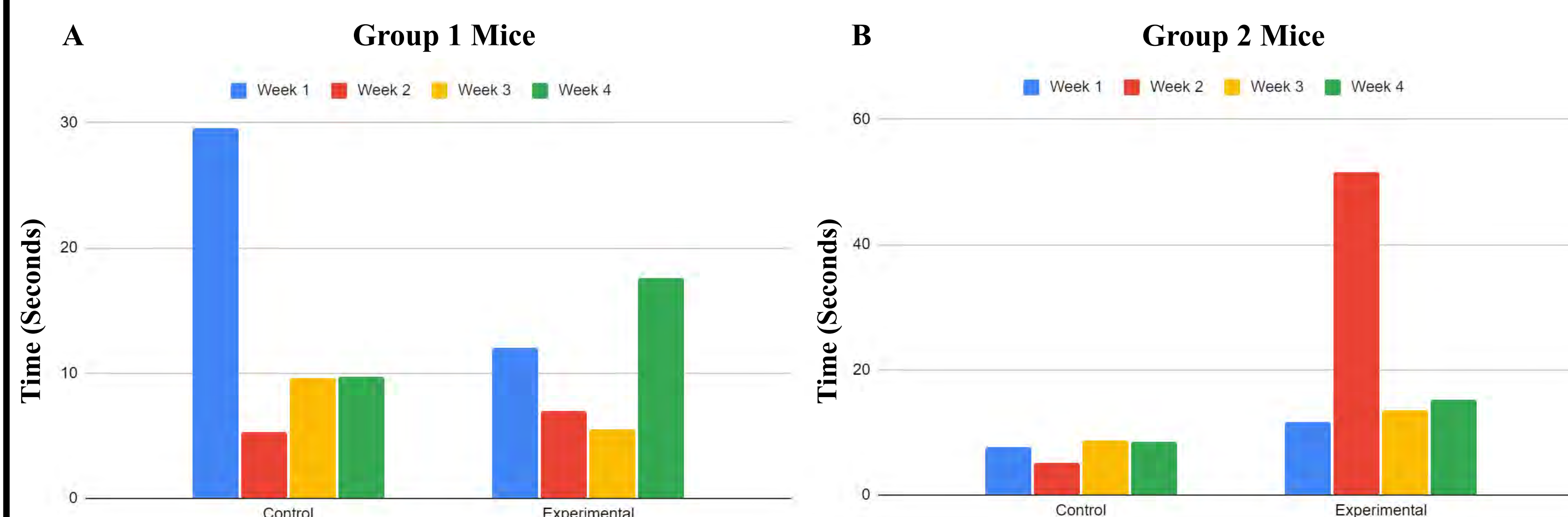


Fig. 3. (A) Average time (seconds) that it took for experimental (n=3) and control (n=3) Group 1 mice to traverse the balance beam. The test was run one time per week for a total of four weeks and data from all four weeks is shown. (B) Average time (seconds) that it took for experimental (n=3) and control (n=3) Group 2 mice to traverse the balance beam. The test was run one time per week for a total of four weeks and data from all four weeks is shown.

2. Simple Neuroassessment of Asymmetric impairment (SNAP)

Methodology: Individual SNAP tests. (A) Interactions. Upon removal from the cage, an uninjured mouse usually avoids being handled whereas an injured mouse would hesitate to escape. (B) Cage grasp. A mouse was suspended by the tail over the cage and allowed to grasp the bars. The mouse was slowly lifted away from the cage, noting the strength of the grasp and whether the paws released simultaneously. (C) Visual placing. A mouse was suspended by the tail and slowly advanced toward a ledge. Uninjured mice arched their back and reached out with both forepaws before touching the ledge (visual component). (D) Pacing/circling. Uninjured mice would ambulate in random directions. Some injured mice paced in the same general direction and were resistant to being guided into the opposite direction. (E) Gait/posture. Uninjured mice kept all four limbs tucked beneath the body when standing or ambulating. Weakness, dragging or abduction of contralateral limbs was observed in many of the injured mice. (F) Head tilt. The head posture of some injured mice was rotated within the coronal plane. (G) Visual field. A fiber-tipped applicator was waved on each side of the mouse, approaching from behind and avoiding contact with the vibrissae. Many uninjured mice would startle or turn toward the movement, whereas injured mice would often not react. (H) Baton. A control mouse would grasp the applicator stick with all four paws. Often the mouse would attempt to "climb" the stick. A brain-injured mouse had more difficulty locating and grasping the swab with the contralateral fore and hind paws.

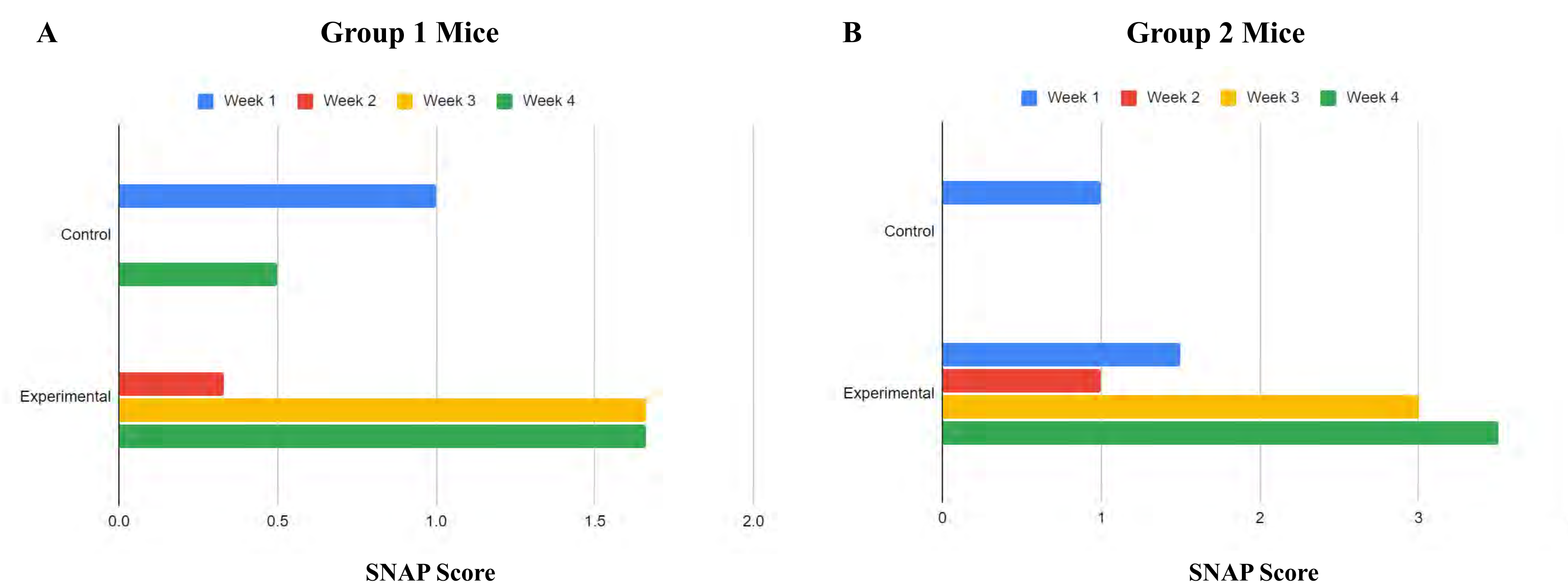


Fig. 4. The mice's scores were found each week based on how they performed for each test. They were given a number, with grade 0 being perfectly normal and grade 5 being absolutely no response or movement for each test. At the end of all the tests for the day the scores were added up and averaged with the rest of the mice's subgroup of control or experimental, for both Group 1 and 2. Looking at graph A and B we can see a change between both control and experimental mice as well as changes in experimentals in each group. In Group 2, experimental subjects had a higher SNAP score meaning their movement and response were delayed or non-existent.

3. Water Maze

Methodology: Water was filled to specific height on a fish tank to allow the platform to lie just below the water's surface so the mice could not see it. They were then placed into the tank and timed to see how long it would take to find the platform. A maximum time of 5 minutes was allowed before the mouse was taken out of the water. For each test run the platform was placed in a different part of the tank.

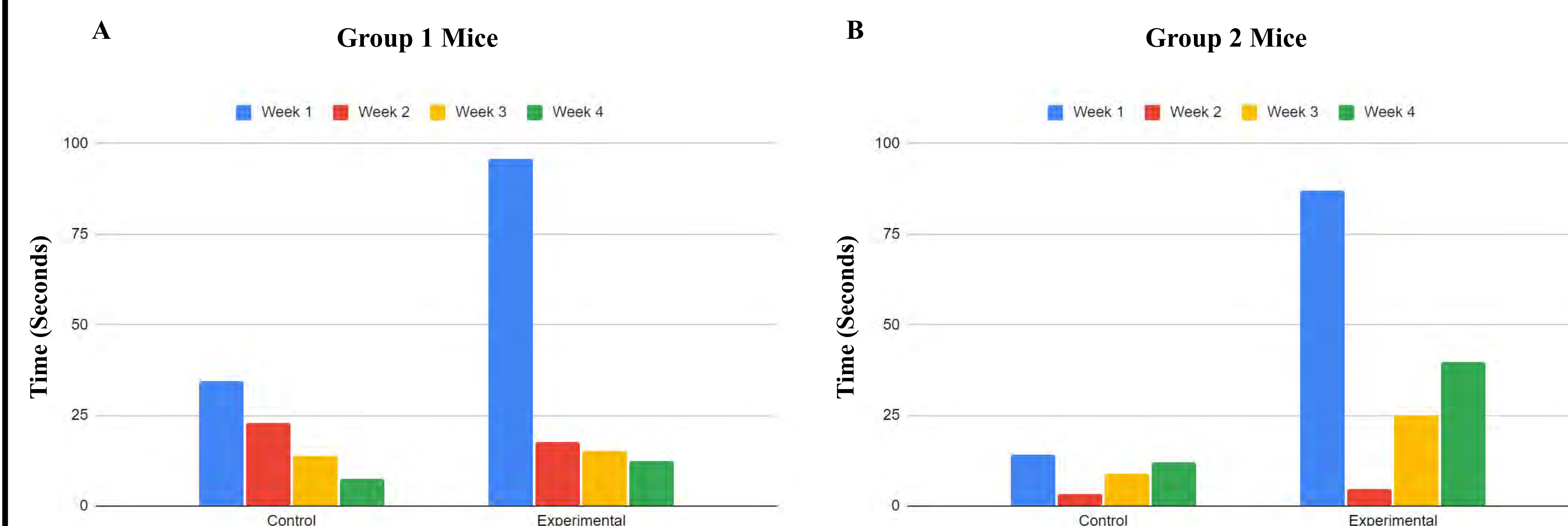


Fig. 5. During the water maze, the timer was started as soon as the mouse's paws touched the water and the timer was stopped when the mouse placed all four paws onto the platform. The platform was moved every week to a different location in the water, and was never repeated. (A) The average time (seconds) for Group 1 mice to complete the water maze during Week 1, 2, 3 and 4 of the experiment. Both control and experimental mice clearly improved over time, with the longest run recorded during week 1 and the shortest run recorded during the fourth and final week. Control mice improved at an even pace over the four weeks, while experimental mice had a drastic decrease in time between week 1 and 2. (B) The average time (seconds) for Group 2 mice to complete the water maze during Week 1, 2, 3 and 4 of the experiment. Control and experimental mice both took the longest amount of time to complete the water maze during their initial run and then drastically improved by their second run (week 2). During week 3 and 4, both control and experimental mice slowed down when compared to their second run (week 2). It is important to note that the experimental mice showed a larger change between each run compared to the controls.

4. Weight

Methodology: Centrifuge tubes were placed onto an analytical balance and then zeroed out. Mice were then placed into the tube to be weighed and the number was recorded.

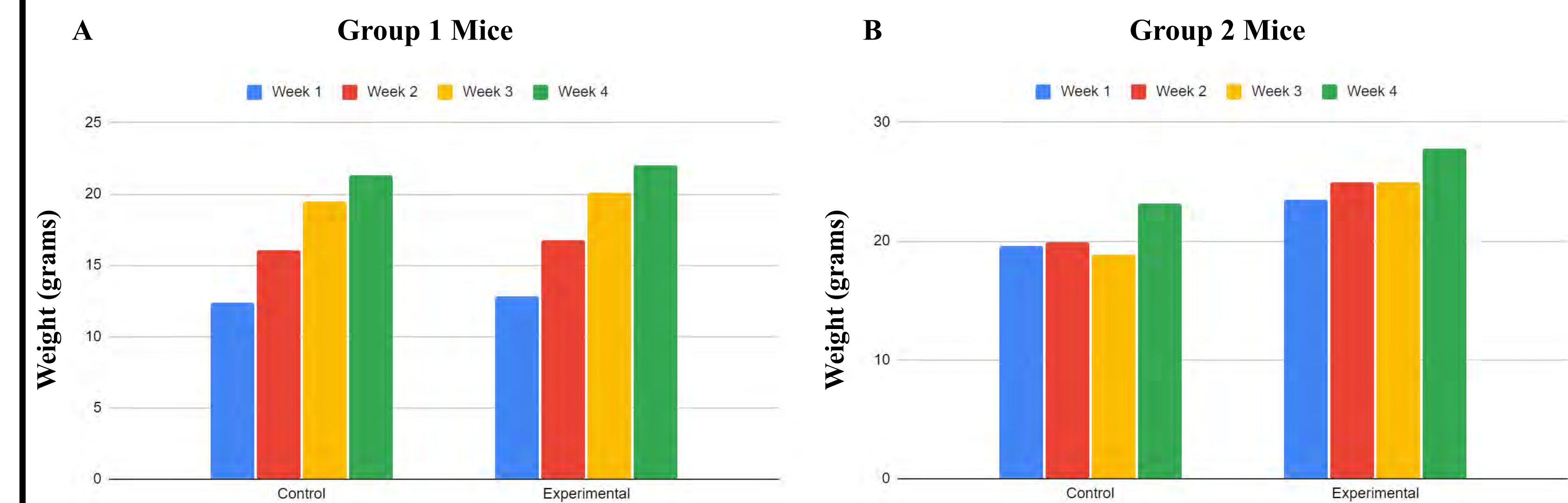


Fig. 6. (A) The average weight (grams) of Group 1 mice during Week 1, 2, 3 and 4 of the experiment. Both control and experimental mice consistently gained weight. (B) The average weight (grams) of Group 2 mice during Week 1, 2, 3 and 4 of the experiment. Traumatic brain injury did not appear to impact the weight of experimental mice.

DISCUSSION

The findings of the experiment showed that memory, movement, and sensations were affected by traumatic brain injury on a consistent basis. This study also showed that the more traumatic injuries the mice sustained, the bigger the impact on the tests. Traumatic brain injury did not seem to impact the weight of mice during the experiment. Both control and experimental mice exhibited a similar trend in weight gain over the four week experiment. As the weeks progressed, experimental mice would stop and look around before continuing to the box of shelter from the light source during the balance beam test. Conversely, control mice would dart to the box as soon as the light source was exposed. During the water maze experimental mice progressively had trouble staying above water as they tried to swim each week. During the final run of the water maze the experimental mice in group 2's heads were completely submerged in the water before swimming back to the surface. In both groups the experimental mice were more docile when handled and did not fight to escape when picked they were handled. Experimental mice also did not respond quickly to being poked in the side by a fine tip needle during the neurological assessment. This suggests that traumatic brain injury does have an impact on neurological behaviors, learning, and memory in mice.

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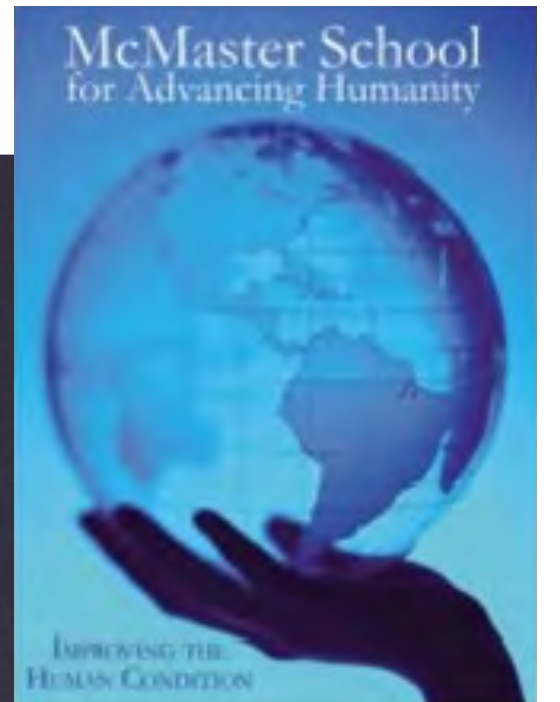
ACKNOWLEDGEMENTS

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REDUCING STRESS IS NOW CRITICAL

ABBE RANK

FACULTY MENTOR: MARY ANN STUDER



ABSTRACT

When I started my project, my original plan was to focus on the health of the villagers in August Pine Ridge, and San Carlos using nutrition education, yoga training, and stressing the importance of hydration. All of this was to help lower their blood pressure. As a result of not being able to travel, my project has changed to focus on relieving the stress caused by the pandemic. The stresses that we face in the United States is similar worldwide. By showing the importance of hydration and using yoga we can attempt to reduce the stress caused by the pandemic.

CONTEXT

Many people within San Carlos and August Pine Ridge struggle with high blood pressure and have requested information that could help them alleviate this issue. By focusing on how the stress caused by the pandemic can be mitigated through proper hydration, and yoga this project can hopefully improve their overall health.

Dehydration can affect anyone no matter their age. For children the symptoms of dehydration are "dry mouth & tongue, no tears when crying, sunken soft spot on top of the skull, and irritability" (Staff, 2019). The symptoms that appear in adults include "extreme thirst, less frequent urination, dark-colored urine, fatigue, dizziness, and confusion" (Staff, 2019). Medications, age, and chronic illnesses can increase the risk of dehydration (Staff, 2019).

Yoga is shown to reduce the risk factors for high blood pressure as well as alleviate mental conditions such as depression, pain, anxiety, and insomnia which could occur as a result of the changes going on because of the pandemic (Harvard Health Publishing, 2015). Some other benefits of yoga are "natural healing, flexibility, back strength, and better digestion" (Harvard Health Publishing, 2015). All these benefits would be important in meeting the community partners needs.

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METHODOLOGY

- Nutrition Education
- Yoga Program
- Hydration Awareness

Components of Original Project

Limitations due to COVID - 19

- Not able to travel and deliver training / materials face-to-face
- The stress of COVID-19

- Focus on reducing stress with a yoga video
- Bringing awareness to the symptoms of dehydration and the effects it can have on overall health

Resultant Protocols

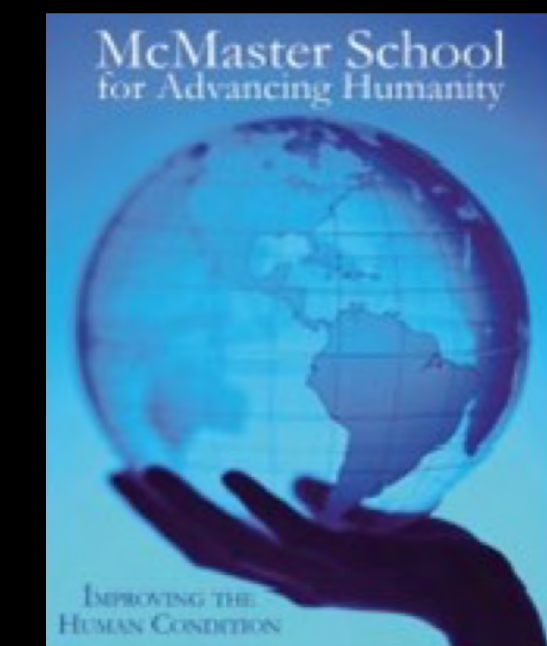
OUTCOMES

I will be recording a yoga video for the August Pine Ridge community and creating cards with yoga poses on them for the San Carlos community. In addition, I will create an informal pamphlet about hydration / dehydration. I will also provide water trackers so that the villagers can track how much water they drink daily. The learning community is currently exploring platforms open to our Belizean partners so that we can share our project's deliverables in addition to sending these materials directly to them.

New River Surface Water Analysis

Alivia Kruczkowski

Faculty Mentor: Mary Ann Studer



Abstract

The New River and the New River Lagoon are two of major freshwater resources in Belize. This project was originally intended to assess the surface water quality of the New River and the New River Lagoon for the Friends of the New River and Programme for Belize. Due to the pandemic travel restrictions the project focused on two main goals. The first goal was to create a comparative analysis of surface water over the last 3 years, utilizing data from previous McMaster Scholars thus providing our community partners with much needed analysis of conditions in the New River. The second goal was to work with McMaster scholar, Autumn Saddler, and create a new map with testing sites labeled. The map will be used in coming years to help make the water testing run smoother while in Belize.

Context

The New River Lagoon is the largest body of freshwater in Belize. The lagoon runs north into the New River. Our community partners, Friends of the New River and Programme for Belize, have asked the McMaster School to assess the quality of the water in both the New River and the New River Lagoon in order to maintain / improve water quality. It is critical to test both surface and subsurface water in these bodies of water, due to past documentation of high levels of nitrates in the surface water. The surface elements tested are nitrate, pH, temperature, phosphates, ammonia-nitrate, dissolved oxygen, and salinity. It is important that the New River and New River Lagoon are healthy because they provide the people in Belize with water and food. One of the biggest issues the people have been facing in the New River is recurring fish kills. Our community partners in Belize do not have the personnel or equipment to do a water quality analysis themselves, so they heavily rely on the McMaster School for consistent water quality assays.

Outcomes

Comparable sites in the New River Lagoon have been tested annually and compiled by the McMaster teams. Comparing testing sites in the New River has been challenging due to varying boat captains, requests from our community partners and differing times of sampling. I have started to create a comparative analysis of the surface water data from the three years that McMaster teams have been testing in the New River and data provided by Belizean sources through Programme for Belize. This comparative analysis shows similar conditions from year to year with the exception of fluctuating nitrate levels. This analysis further illustrates that the condition of the waterway is consistently on the verge of not being able to sustain marine life and thus explains to some extent the potential for repeated algal blooms during warmer weather and when industrial runoff is greatest.

Methodology

Original Project:

Assess the surface water quality of the New River and New River Lagoon. Provide water quality data to the Friends of the New River and Programme for Belize.



COVID-19

Due to the current pandemic the McMaster School decided it was in the best interest for everyone if the learning communities did not travel this year.



New Protocols:

Create a comparative analysis of the surface water quality over the years for my community partners to better understand the waters trends. Help in creating a new map of the waters for the McMaster School.



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WATER QUALITY ANALYSIS IN NORTHERN BELIZE

AUTUMN SADDLER

FACULTY MENTOR: MARY ANN STUDER



Abstract

Initially this project was to assess subsurface water quality in the New River and New River Lagoon for the Friends of the New River and Programme for Belize. Due to travel restrictions, I compared and analyzed data collected by the McMaster School and local entities in past years. This analysis will enable all constituents to have a more complete picture of the condition of these connected waterways. This project will also help future projects on this waterway by mapping out the critical testing sites determined former McMaster teams in collaboration with our community partners.

Methodology

Original Project

- Assessing levels of phosphates, nitrates, pH, dissolved oxygen, turbidity, salinity, and water temperature in the subsurface waters of New River and New River Lagoon for Friends of the New River and Programme for Belize.

Adaptability

Covid-19 Limitations

- Travel restrictions prevented this project's on-site testing
- Community partners do not have the tools or personnel required to conduct a water quality assessment usually completed annually by the McMaster School for Advancing Humanity.

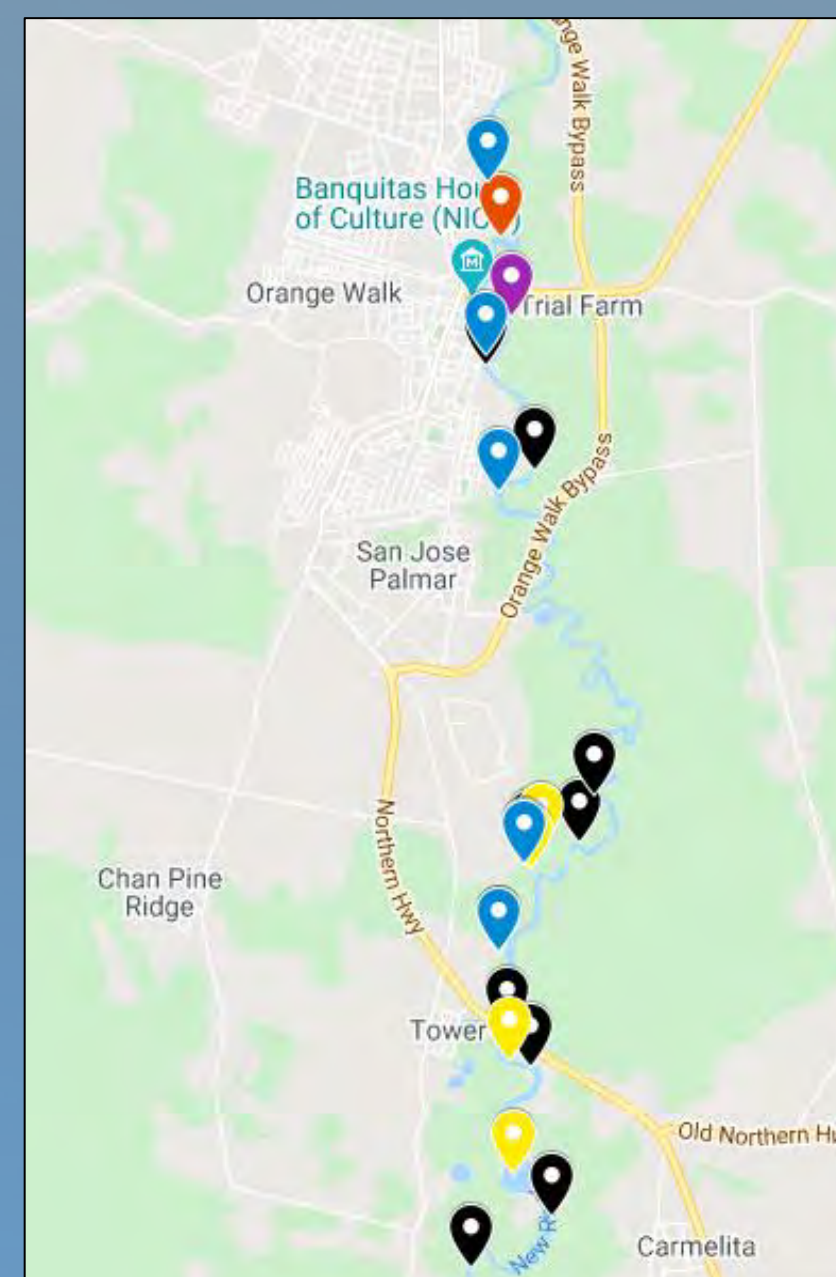
New Protocols

- I conducted an analysis of data collected by the Sarteneja Alliance for Conservation and Development and Programme for Belize after the mass fish die-off in 2019.
- Finding similar testing sites to those documented by former McMaster teams so that I compared the data to Defiance College's data, looking for any red flags that may have indicated critical water conditions.
- Fellow Scholar Alivia Kruczkowski, and I will be plotting the coordinates of testing sites on a map for future scholar and community partner use.

Background

From 2010-2012 McMaster scholars and fellows found high nitrate levels in the New River Lagoon at the surface level. This caused the McMaster School for Advancing Humanity to begin testing subsurface water to determine if the high nitrates were just a result of land runoff after the rainy season or if it was an indicator of the lagoon water quality declining. Since then, there has been no water quality parameters consistently out of range in the lagoon.

The connected waterway, the New River, had mass fish die-offs in the summers of 2017 and 2019. Programme for Belize and Friends of the New River requested that Defiance scholars begin testing surface and subsurface water in the New River in 2017. In July of 2019, after the second fish-kill event, the Programme for Belize sent water quality results collected from eleven sites on the New River. Most recently in December of 2019, twenty-nine different sites along the New River were tested at the surface and subsurface levels by McMaster scholars and fellows. Some of these sites were found to have low dissolved oxygen levels or high phosphates. The community wants testing by the McMaster School for Advancing Humanity to continue to determine probable sources negatively impacting water quality and the development of a remediation plan.



Results

When comparing the McMaster team's December 2018 results with July 2019 results collected by the community partners, I found several interesting points. One being that the community tested further upstream than McMaster teams. The community was concerned for the water health upstream since contaminants could flow downstream. Another being that while the Programme for Belize found lower than usual dissolved oxygen levels at many of their test sites while the McMaster school only found low dissolved oxygen at two sites - both in deeper water. The McMaster school's tests did indicate some high phosphate levels. Phosphate levels along with warmer weather could lead to algal blooms. Which were said to be visible after the July, 2019 fish-kill. Determining the source(s) negatively impacting the New River requires much more data, but developing a baseline for this waterway is foundational to this process.

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