A Nonhuman Primate Model of Anxiety-Induced Alcohol Abuse and Alcoholism

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A Nonhuman Primate Model of Anxiety-Induced Alcohol Abuse and Alcoholism

Summary

This is the final report for the MEG Grant titled: *A nonhuman primate model of anxiety-induced alcohol abuse and alcoholism*. The formal phase of the project ran from June 1 through August 23, 2016, with the students learning how to safely work with their research subjects, joining a research team, and collecting their data. Following the formal phase, the students returned to BYU where they used the data they and the other students collected to write scientific manuscripts and posters to present their data. Eight students took part: Elizabeth Wood, Alexander Baxter, Natalie Lange, Travis Norseth, Esther Page, Spencer Waters, Jenna Jackson, and Kendall Cvetko. They were selected from a number of applicants based on letters of recommendation, interests, and prior training.

Overview

The design of the internship was to provide students with hands on experiences to investigate the factors that lead to excessive teenaged alcohol using a rhesus monkey model. The internship is designed to provide the students with mentored experiments at all levels of a research program from the initial hypothesis, experimental design, data collection, statistical procedures and write-up and presentation. The internship is calculated to allow students to use the skills that they learned in their classroom settings to carry out research experiments in closely mentored settings and to teach students the differing levels of a research program from the initial hypothesis, planning and experimental design, through the steps of data collection and storage. In May, the student interns were provided the background readings and submitted critical summaries of the papers. In June, the interns were taught the methods and procedures to conduct the experimental research. Because the students had taken the required statistics and primate behavior courses, they were able to use their knowledge to perform statistical tests of the data, and finally for those who did not graduate, the write-up and presentation phase became the culmination of the internship by presenting their findings at the Mary Lou Fulton symposium in the spring of 2017.

What follows is taken from the summer syllabus that was developed over the past decade. It is given to the students as they begin the internship.

Internship Objectives

1) To apply the knowledge that was learned in the Winter Primate Behavior course using hands-on experiences. Background material that is specific to the research will be assigned as reading concerning development, anxiety, alcohol abuse, and primate models.

2) To learn how hypotheses are developed and used in scientific practice, the importance of experimental control and the importance of daily preparation in research practice.

3) To learn fundamentals of laboratory procedures and research team practices.
4) To learn fundamentals of data collection and storage.

5) To experience hands-on research team membership, with its complexities of personality and differing methods.

6) To formulate hypotheses concerning the data that you will collect.

7) To formulate statistical tests of the hypotheses and carry them out.

8) To integrate personal values and belief systems with the material learned in the Internship.

9) To learn how to integrate principles of psychology into our church service and interpretation of the gospel.

**Hands-on Aims of the Internship (three phases):**

1. First learning the theoretical background and experimental methods of the research.

2. Second learning the procedures to safely collect data and then becoming an active member of a research team, preparing the materials and actively applying what they have learned as you collect and organize your data each day. In addition to collecting data each day, data entry and organization are fundamental to this phase.

3. Formulation of hypotheses and hypotheses testing are a major aspect of the final grade. Following your summer experience, students are expected to continue to develop their hypotheses into posters for the Mary Lou Fulton Undergraduate Symposium or to present your data at a national meeting.

**Summary of the overall activities of the formal phase of the internship**

We arrived in California late on Monday, and moved into our apartments. The next day, students shopped for food and supplies to move into the apartments. Wednesday the students visited the Primate Center for the first time. This was a very exciting moment for the students who were seeing the monkeys that they were going to be working with for the first time. They were also able to meet Drs. John Capitanio and Karen Bales, my collaborators and Principal Investigators who had the grant that paid the monkey daily per diems. The June is designed to teach the fundamentals of working with monkeys and involves some classroom experiences, as well as hands-on training with the monkeys. Most of the students had already taken my Primate Behavior course, which was great preparation for the research and gave the students a broad background to understand the monkey’s behavior. The theoretical basis of the specific research to be carried out that summer was presented in readings and lectures. In July, the students join a research team and each day collect behavior and physiological data from the monkeys. As the students become familiar with the unique individual differences in how the monkeys respond, and use what they learned in June, at the end of the month they submit a testable idea, a hypothesis that they can test with the data that they are collecting. They continue in August to work daily with the monkeys collecting data. All are expected to develop a set of testable hypotheses that they can use the data they collect to test. As they refine their hypotheses, they test them with data that they collect to formulate an abstract that will be the basis of a poster that they will present at the Mary Lou Fulton Undergraduate Symposium. Many go on to give presentations at major scientific societies such as the American Society of Primatology.

The students are taught that they will get out of the experience proportionate to what they invest. They are told that the goal is to understand what we cover and to integrate it into your personal experience.
Mastering the Internship Objectives

Mastery of the Internship material will be measured by

1. June – Demonstrate and understanding and perform a critical assessment of the readings, assigned by asking questions and performing self-ratings of your preparation. Participating in the training sessions and demonstrating proficiency in both the safety and experimental procedures.

2. July through August the students show proficiency as they engage in

→ Daily preparation of materials and supplies to collect data
→ Organization and planning of tasks.
→ Accuracy in data collection and entry.
→ Formulation of hypotheses and tests of the data that each student will collect.
→ Maintenance of a daily laboratory record book, complete with subject and experimental problems.

Schedule of Topics for Classroom Discussion and Hands-on Research

<table>
<thead>
<tr>
<th>Date</th>
<th>Task/Assignment</th>
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<tbody>
<tr>
<td>April</td>
<td>Provide necessary contact and background information for background checks.</td>
</tr>
<tr>
<td>May-June 10</td>
<td>Obtain TB test; Take Van Test, Read background materials, Provide apartment deposit and background information.</td>
</tr>
<tr>
<td>June 12, Sunday</td>
<td>Pack van for early departure</td>
</tr>
<tr>
<td>June 13, Monday</td>
<td>Leave for California, 6:30 AM. Arrive motel in Davis, 10 PM</td>
</tr>
<tr>
<td>June 14, Tuesday</td>
<td>Check into apartments, view outside of the Primate Center; purchase apartment supplies and groceries</td>
</tr>
<tr>
<td>June 15, Wednesday</td>
<td>Tour Facilities, begin training, get badges, turn in TB tests and other medical forms</td>
</tr>
<tr>
<td>June 16, Thursday</td>
<td>Classroom: Effects of sociality support &amp; loneliness on health</td>
</tr>
<tr>
<td></td>
<td>Observe Monkeys</td>
</tr>
<tr>
<td>June 17, Friday</td>
<td>Classroom: Relationship of oxytocin on sociality – Observe Monkeys</td>
</tr>
<tr>
<td>June 19, Sunday</td>
<td>Attend church, unmarried students go to Singles Ward</td>
</tr>
<tr>
<td>June 20, Monday</td>
<td>Classroom: Temperament &amp; Biology-Capitanio (Capitanio readings)</td>
</tr>
<tr>
<td>June 21, Tuesday</td>
<td>Classroom: Temperament and Health—Capitanio Readings</td>
</tr>
</tbody>
</table>
June 22, Wednesday  Classroom: Oxytocin and Social Bonding-Bales Reading

June 23, Thursday  Classroom: Working safely with monkeys

June 23, Thursday  Summer Symposium Series, Lab Meeting

June 24, Friday  Hands-On: Working safely with monkeys

June 26, Sunday  Attend church

June 27, Monday  Lab Meeting, Classroom: how to enter and check data; Choose research project to work on

June 27, Monday  Family Home Evening (Institute FHE)

June 28, Tuesday  Working safely with monkeys

June 29, Wednesday  Hands on Safety procedures

June 29, Wednesday  Evening—Ward Activity

June 30, Thursday  Summer Symposium Series, Lab Meeting

July 1, Friday  Hands on – Walk through research procedures

July 1-9  Begin assigned research team tasks; Choose research subjects

July 3, Sunday  Attend Church, Collect data ½ day

July 4, Monday  Celebrate the 4th

July 5, Tuesday  Begin data collection

July 6-8  Work with research team to collect data

July 7, Thursday  Summer Symposium Series, Lab Meeting

July 10, Sunday  Attend church

July 11-15  Continue data collection

July 11, Monday  Family Home Evening

July 14, Thursday  Summer Symposium Series, Lab Meeting

July 17, Sunday  Attend Church

July 18-22  Continue Working on Projects

July 23, Thursday  Summer Symposium Series, Lab Meeting

July 24, Sunday  Attend church
July 25-29  
Continue Working on Projects

July 27, Wednesday  
Outline of hypotheses due

July 28, Thursday  
Summer Symposium Series, Lab Meeting

July 31, Sunday  
Attend church

August 1, Monday  
Collect behavioral data; begin collection of blood samples for DNA testing

August 1, Monday  
Family Home Evening

August 1-5  
Continue Processing DNA and readying for shipment

August 4, Thursday  
Summer Symposium Series, Lab Meeting

August 7, Sunday  
Attend church

August 8-12  
Collect behavioral data; begin collection of blood samples for DNA testing

August 11  
Summer Symposium Series, Lab Meeting

August 14, Sunday  
Attend church

August 15, Monday  
Assess end reliability, double check and summarize data

August 15, Monday  
Family Home Evening

August 12-24  
Finish data checking and complete data collection

August 25  
Clean and check out of apartments

August 26  
Return to Utah

There are several secondary objectives and learning experiences to which the student are also exposed. First, the students learn that in the working environment and research settings there are many varied personalities. They learn that research teams and personnel function on good will. They are taught that over the summer there will be personality differences and at times disagreement and conflict. Learning how to get along with others and to operate in an atmosphere of diverse temperaments is a fundamental aspect of the experience.

Second, they are exposed to Dr. Higley in both the working research setting and also the ecclesiastical setting. This is an important goal of the project. Students are able to see how a researcher can live in a secular day-to-day research world and have a spiritual, testimony- centered life. The single students attend the singles’ ward and provide the bulk of staffing of the ward over the summer.

**Outcomes and Mentoring**

**Subject Reports-Student Views:** Without exception, the students gave glowing reports of the summer experience. In those reports, the number one experience that they mention as the best aspect of the summer were those times where they were able to work with Dr. Higley and/or the other Senior researchers and/or their gradual students. When they had them alone or in a small group setting where
they could ask questions about the their experiences and advice about graduate school or other concerns. This was not necessarily what I expected the first year of the internship this, but it continues to be a frequent occurrence that I now design those moments into the summer. As a mentor, I not only met with the student each week during our formal lab meetings, but worked with them each day watching them grow and develop. Frequently we had conversations about what they were learning and the exciting insights that they were having. They reported to me that the research they were performing made the classwork “real”. Moreover, they reported that they loved doing this and could see themselves doing this in graduate school.

On other occasions they were learning in the “school of hard knocks”. These experiences were often just as valuable as those formally designed experience because they became teaching moments, where the students were motivated to learn. I think a valuable mentoring experience for them was when we shared how we had solved these “crises” in our own lives. Most often the challenges the student’s faced were people-oriented difficulties. Teaching the young mentees about how collaborations function and working with people that you disagree with was central to the mentoring.

**Academic Outcomes:** *Student Outcomes* – Six of the students had another year at BYU after the internship. All five gave poster presentations at the Mary Lou Fulton symposium from the data they had collected. Elizabeth Wood, Alexander Baxter, Natalie Lange, Travis Norseth, Spencer Waters, and Jenna Jackson. Jenna Jackson won first place in the competition. Four of the students, Jenna Jackson, Elizabeth Wood, Alexander Baxter, and Spencer Waters took the internship a step further by submitting abstracts to the American Society of Primatology in Chicago, IL, the principal Scientific Society for the study of nonhuman primates. Their abstracts were accepted and they gave poster presentations at the meeting. Their presentation was well received and with their rich background of experience in primatology, their presentations were equal to and in many cases superior to those of the graduate students who were also attending. In fact, Alexander Baxter and Elizabeth Wood were a finalists in the student competition.

**Scholarly Outcomes:** Not only was I an author on the student’s papers that were presented at the American Society of Primatology, but thus far I have given two symposium presentations that were based on the data that they and the other students collected. Moreover, we have a manuscript that we are about to submit the relationship of genotype using the data that the students collected. Given the lag time between data collection and manuscript preparation, I expect a good deal of completed manuscripts this to come from this project.

**Description of the results/findings of the project:** There was a nice correlation between early anxious temperament and alcohol intake in the adolescents. Data also showed that subjects with the deleterious serotonin transporter genotype showed high anxiety, more time alone and there was a trend to act more aggressively when provoked.. We also found that aggression is stable across time.