

Research Plan

I. Rationale

Mental health issues such as depression or anxiety can be triggered by acute or long term stress not only in humans but as well as in mice. 322 million people around the world are affected by depression alone, thus making this a public health priority according to the world health organization. However, stress responses can range from mental illnesses triggered by such experiences or the development of resilience which can protect such animals from becoming susceptible to future stressors as reported by Beery et al. Although there has been a lot of research in the field of mental health there is still debate on prosocial effects of acute stress. Past studies have reported that acute stress does not have prosocial effects whereas more recent papers have reported the opposite.

As previously stated stress can lead to a multitude of mental illnesses which are a serious threat to the public. However, past research has demonstrated that social interaction before an event can help as a buffer to such stress. As a result many of these individuals may be stress resilient, thus not only are they unaffected by these events, but also they will perform better in the future (Dawans et al). Consequently, the same study by Dawans et al investigated if individuals exposed to stress exhibited prosocial behavior after a stressful event. The study demonstrated that humans use social buffering as a coping mechanism. This furthers the “tend and befriend” hypothesis that engaging in prosocial behavior after stress is a protective pattern

against the negative responses to stress. Furthermore, as stated in the study by Buchanan and Preston, when an individual sees another in need it will display altruistic or unselfish behaviors.

II. Research Question

Do mice who respond differently to stress have different coping mechanisms to deal with their psychological trauma?

III. Methodology

Animals

Thirty C-57 male mice were used, 20 were put into the RVSS or experimental group and 10 were placed into the control group.

Housing and Care

The mice were individually housed to promote feelings of thwarted belongingness and anxiety, as it is part of the RVSS model. Each mouse was given ample water and food by staff in the Hunter College. The mice were kept in cages that had 9 inches x 7 inches x 6 inches.

Behavioral Testing

This study implemented the use of seven behavioral tests aimed at testing depression and anxiety: elevated plus maze, open field test, spray test, male social interaction test, female social interaction test, sucrose preference test, novel object test. An elevated plus maze focuses on the animal's fear of a predator and its anxiety, which in that way it is similar to the open field test. It utilizes a box with a "+" across the base area. Two of the arms are closed representing a sheltered area and two of the arms are open. If the mice spend more time in the sheltered or closed arms, it is indicative of anxiety. Open field tests are primarily used to test anxiety by

placing a mouse in an open box and tracking its location. Once again, Ethnovision can determine its position in the box, inner or outer area, and mice who spend the majority of their time on the outside of the box are labelled as susceptible because they fear a predator more. The spray test is best able to determine symptoms of depression such as a lack of grooming. The experimental mouse is sprayed with a sucrose solution and is recorded for five minutes. When the five minutes is over, the total grooming time of the mouse is determined and recorded. The mice with the highest grooming times are seen as resilient because they have motivation to take care of themselves. A social interaction test consists of a target mouse placed in a cage within a large box and the experimental mouse placed within the box. Ethnovision records the cumulative duration of the time spent in the hex-zone, the area around the cage, which can indicate which mice are susceptible and which are resilient. Resilient mice will have spent the most time within the hex-zone whereas susceptible mice will spend the least amount the time. A sucrose preference test was run to determine if reward seeking behavior was increased. The mice had two bottles of water in their cages for 24 hours to make them accustomed to 2 bottles. Then, in the next 24 hours a bottle of sucrose was added and the amount of sucrose and water consumed were determined. If mice had a significant preference over the control mice for sucrose then reward seeking behavior had increased. Lastly, the novel object test was used to determine working memory of mice. Mice were given a 5 minute period to interact with two objects that were the same. They were left for an hour and then were introduced to one of the same objects and then a new object. If mice spent more time with the new object it meant that they remembered the other object and thus working memory had increased. The use of these tests can eliminate error if, for instance, only one behavioral test were to be used.

IV. Human Participants Research

- a. Not applicable to this project.

V. **Vertebrate Animal Research**

- a. . Certain alternatives have been taken to reduce the use and pain of the vertebrates. For example, to refine the procedures to prevent any pain experienced by the animals, sedatives were used as opposed to euthanasia. In addition, the use of aversive stimuli was avoided at all costs. Lastly, to reduce the use of vertebrates for this paper, the vertebrates were used for several other projects.
- b. This research will be extremely applicable to creating more efficient treatments for stress related disorders. In addition, this research can be used to create better treatments for drug abuse.
- c. These mice underwent behavioral testing and RVSS treatment (mild stress) as described in the methodology of this research plan.
- d. There were 30 male C57B16 mice used.
- e. The mice were individually housed to rumination, as it is part of the RVSS model. Each mouse was given ample water and food by staff in the Hunter College. The mice were kept in cages that had 9 inches x 7 inches x 6 inches.
- f. These animals were used for an ongoing experiment and thus were not sacrificed.

VI. Potentially Hazardous Biological Agents

- a. Not applicable to this research.

VII. Hazardous chemicals, activities, and devices:

- a. I was trained by my mentor (Dr. Friedman) and taught how to use all equipment safely, for example how to handle dry ice. In addition, I always wore the proper safety gear, for example gloves, a face mask, and close toed shoes.

VIII. Data Analysis

For the majority of the analysis Ethnovision was used: this allowed for the tracking of the mice, creation of heat maps, and recorded videos of each trial. The data collected from Ethnovision was from behavioral tests such as social interaction tests, open field tests, , spray tests, and elevated plus maze tests. The behavioral data could then be further analyzed on programs such as prism, which can run statistical tests and create graphs.

IX. Bibliography

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X. Addendum

No changes were made from the original research plan.