**INTRODUCTION**

Ethology is the study of animal behavior. Behavior is everything an animal does and how it does it. Many behaviors are responses to sensory input such as sight, sound, smell, touch, and taste. Reactions to sensory input may be an innate (genetically inherited) response, a learned response, or a combination of the two.

**OBJECTIVES**

After completing this laboratory, you should be able to:

1. Describe some aspects of animal behavior, such as orientation behavior, agnostic behavior, dominance display, or mating behavior.
2. Understand the ultimate cause (evolutionary purpose) of the behaviors.
3. Perform a chi-square test to determine whether a preference (food, substrate, moisture, etc.) exists.

**BACKGROUND**

An innate response or behavior is inherited and involves the genetic sequence of the organism. An innate response will be mostly the same for all the organisms within the species regardless of the environment, including a lack of “normal” upbringing. A learned response is a response that is modified based on the specific experiences of the organism. A learned response will vary directly upon the life experiences of the individual organism. For example, a male Drosophila is able to create a mating song with its wings, even if it is reared in isolation. Therefore the mating song of Drosophila is an innate behavior. In contrast, a sparrow raised in isolation will never be able to correctly produce its mating song because the song is a learned behavior.

Orientation behaviors   are innate moving behaviors that put the animal in a favorable environment. Stimuli that may cause orientation behaviors include chemicals, water current, electricity, gravity, light, moisture, temperature, sound, and touch. There are two main types of orientation behaviors – taxis and kinesis. Movements directly toward a stimulus are called positive taxes (singular = taxis) while movements directly away from a stimulus are called negative taxes. If a taxis response is exhibited to a specific stimulus it is described by using the term –taxis as the suffix along with the appropriate prefix referring to the stimulus (see Table 1). Thus the term hydrotaxis, for example, describes an orientation response to water. The same prefixes may also be used with the suffix –kinesis to describe a kinetic response. Kinesis is a change in the overall amount of movement and turning. Kinesis may be either positive (toward) or negative (away from) a stimulus, but the overall motion occurs via general, random movements. If an organism responds to bright light by moving in a direct line, it is exhibiting phototaxis. Kinesis occurs when an animal responds to bright light by random movements in all directions away from the light.

Agnostic behavior is exhibited when animals from the same species respond to one another by aggressive or submissive responses (fighting or fleeing). Agnostic behaviors are complex, often with both innate and learned components. Usually an aggressive agnostic behavior is simply a display that makes the individual seem big or threatening. True fighting generally only occurs during mating season. A dog raising its fur and baring its teeth or rolling onto its back is displaying agnostic behavior.

***IMPORTANT:***

* ***You and your group are responsible for obtaining, transporting, and caring for your organisms. You must have AT LEAST 30 individuals and they MUST be present in class on lab day in order to earn your 10-point participation lab grade!***
* *Remember that you are working with live organisms! Treat them with care and respect.*
* *Although the materials in this lab are nonhazardous, follow normal safety precautions. Wash hands thoroughly with soap and water before leaving the laboratory.*

**Part I: Research & Observation of Organism**

1. Go online and collect information about the organism you will be using for your behavior experiment. You may need to observe your organism to collect addition information prior to beginning the experiment. You should focus on information such as:
   1. List the preferred food sources of the organism:
   2. Describe the habitat they prefer:
   3. Explain how the organism carries out respiration:
   4. Describe the structures that enable locomotion:
   5. Is your organism endothermic or ectothermic? How does this impact their response to stimuli?
   6. What kinds (if at all) of agnostic behavior do they exhibit?

**Part II: Planning & Implementing Your Experiment**

1. You will be setting up what is known as a “choice chamber” for your research specimens. This is simply an enclosed container that offers two or more choices to the specimens. You will need to think about that materials/how you will construct this chamber and have it ready to go in class tomorrow.
2. You will simply count the number of individuals in each “choice” area at a time interval and duration of your choosing. I recommend at least once every 30 seconds for at least 10-15 minutes.
3. Identify the following before progressing to the rest of your procedural design:

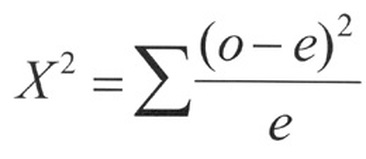
* **Scientific Question**
* **Experimental Hypothesis (“If…then…because…”)**
* **Experimental Variable**
* **Control Variables**
* **What data will you collect, how often, for how long?**
* **Sketch a table below that you will use to record your data**

*\*On a separate sheet of paper, or a class whiteboard, list the materials you will need, sketch what your choice chamber will look like, and plan out the rest of your formal procedure. If you use a whiteboard, take a picture of your final plan!*

**Part III: Analyzing Your Data**

1. You will need to produce a graph to visualize the data. Your graph MUST represent the average number of individuals in each chamber and MUST include error bars!
2. In addition, we want to know whether there is a preference for one chamber over the other. We can accomplish this with a chi-square analysis. This test determines whether or not there is a statistically significant difference between the choice chambers.
3. You will need to review Bozeman’s [Chi-Squared Test](http://www.bozemanscience.com/science-videos/2011/11/30/chi-squared-test.html?rq=chi), [Standard Deviation](http://www.bozemanscience.com/standard-deviation/), and [Standard Error](http://www.bozemanscience.com/standard-error/) podcasts before coming to class. As you watch the video, complete the worksheets that were handed out in class. **These documents will be collected as a separate pre-lab grade**. You are expected to come to class with an understanding of how to perform these statistical calculations!

* State the null hypothesis (Ho):
* Perform a chi-square analysis using the data you collected during your experiment.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Choice Chamber** | **Observed (o)** | **Expected (e)** | **(o-e)** | **(o-e)2/e** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | **Total=** |  |  | **Sum (X2)=** |

* W

**Part IV: Discussion of Results**

Finally, you need to interpret the results of the chi-square analysis and draw conclusions. Be sure to include the following information in your discussion:

1. Refer back to the experimental hypothesis.
2. Was there any support for the experimental hypothesis?
3. Chi square analysis
   * How does the chi-squared value compare to the critical value?
   * Should the null hypothesis be rejected or fail to be rejected?
   * What does this say about the organisms of interest?
4. Propose a model for how your organism responds to environmental cues.
   * What generalizations can you make about the organisms under study based on the collected data?
5. Identify and discuss potential sources of error.
   * Identify at least one potential source of error.
   * Explain how the source of error impacted your data.
   * Propose at least one improvement to the experimental design that would correct for the source of error.
   * Predict how this improvement might alter future data collection.