

Question Section: <b>Things you know that you don't know</b>	Question Section: <b>Things you didn't know that you don't know</b>
<p>What are the signs when Hamsters are scared?            How can Hamsters learn?            What are the different types of maze?            What do Hamsters eat?            What is classical conditioning?            Why is counter conditioning preferred?            What is a MWM?            Do Hamsters sleep during the day?            How is radial arm maze used? What does it test?            Why is an open maze used in our experiment?            Were Female Hamsters faster than Male Hamsters in memorization?</p>	<p>What are the different types of Classical Conditioning?            Why do Hamsters freeze when they are scared?            What is Operant conditioning?            What are the signs of stress in the Hamster?            What is a literature review?            What do different types of Maze test?            Can Hamsters navigate?            Why do the Hamsters need the skills?            How is counter conditioning performed in the rodent?</p>

**Things you know and things you learned.**

- We will conduct the experiment by using future boards to act as a path and barriers for the Hamsters to complete the maze. They are non toxic, could easily be cut into pieces and are lightweight.
- Hamsters are scavengers and would often burrow in it's beddings
- Hamsters can get scared and uncomfortable.
- In the experiment, hamster's livelihood and stress levels must be concerned.
- Classical Conditioning is often used in dogs (Pavlov Dog)  
24<sup>th</sup> April
- **Signifies fear:**
  1. **Lie on their back**
  2. **Puff it's cheeks**
  3. **When it empties its cheek pouches quickly:** This is a hamster that is insecure about the current situation and is likely to flee and hide.
  4. **Standing on hind legs with their dukes up:** A hamster with this body language is telling you it feels threatened and might get aggressive if you don't back off.
  5. **It gets startled when you approach:** This is another sign that your pet is feeling insecure and unsure of what is going on at the moment.
- **Signifies happiness:**
  1. **Opens its mouth and stretch their limbs,** they are feeling good and relaxed about their current situation.
  2. **Jumps around**

3. **Burrowing in bedding:** This means a hamster is happy and just digging around playing or searching for a possible snack it may have buried earlier.

25th April

- Hamsters are nocturnal which means that they sleep during the day and wake up during the night. There are several ways to indicate that they are afraid or that it is happy, such as what we stated above.
- There are many ways in which an individual can learn, there are associative learning where animals can associate their learning from a positive or negative stimuli. In animals there are typically two types or ways in which they can learn 1). Operant Conditioning 2). Classical Conditioning. Operant conditioning can be represented as learning through sequences and classical conditioning could be learned through associations.
  - Classical conditioning is learning process where there are associations between two stimuli. The first stimuli is a stimuli that would cause an immediate response, the stimuli induces a natural response such as mouths watering with saliva, once the subject begins to smell delicious food. The smell of the food is a stimuli that causes an immediate response which is to salivate. The smell of food is an unconditioned stimulus or UCS which results in an unconditioned response or UCR which is to salivate. This is when a conditioned stimuli plays a role which it would be presented along side with unconditioned stimuli ( food smell), the conditioned stimuli such as a bell sound would be played along side the smell of food. The conditioned stimuli (bell sound) that is paired with an unconditioned stimuli (food smell) would trigger an unconditioned stimuli (salivate) once the process is repeated again and again. After the exposure, if the individual hears the sound of the bell, it's mouth would start to salivate.
  - Flooding is a method where the animal is exposed to stimulus for a certain amount of time and then the rodent would soon be used to the stimuli and see that the stimuli does not cause harm so the rodent would not fear it anymore.
  - There must be variables that are controlled, the process must not be stopped until the rodent does not fear the subject anymore, if it is stopped before, the rodent could become more fearful than before.
  - Desensitisation is a similar process however, the rodent would be exposed to the stimulus slowly and overtime the rodent would no longer react to the stimuli.
  - Graded exposure is when the rodent is exposed to the stimulus, the trainer would need to break down in series of where the rodent is so that the stimuli could be added such as moving closer to the rodent etc.
  - Counter conditioning is a method where the trainer uses a positive method to change the rodent's emotional state by providing food for the rodent which would be represented as the first stimuli and the second stimuli could be the trainer or the feared stimuli and each time the rodent sees the trainer or the feared stimuli, provide the rodent with the first stimuli which is its favorite food. Soon the rodent would not fear the second stimuli.

26<sup>th</sup> April

- The last method that could be used is the graded counter conditioning where it is a mixture of counter conditioning and graded exposure.
- The purpose of using conditional learning is to allow the rodents to become familiar and to learn that the trainers are not going to harm. After observations, counter conditioning is the best method in allowing the rodent to be familiar and to decrease or eliminate it's fear of the trainer.

26-27<sup>th</sup> April

- There are many types of Mazes such as Morris Water Maze, Radial Arm Maze and an Open Maze.
- Counter conditioning is used and preferred because counter conditioning is a method where the trainer uses a positive method to change the rodent's emotional state by providing food for the rodent which would be represented as the first stimuli and the second stimuli could be the trainer or the feared stimuli and each time the rodent sees the trainer or the feared stimuli, provide the rodent with the first stimuli which is its favorite food. Soon the rodent would not fear the second stimuli.

29<sup>th</sup> April

- Morris Water Maze (MWM), this maze involves the rodent to be placed in a pool of water and there are platforms just a little under the water, the rodent must escape the

water by getting to the platform. There would be visual factors used to help the rodent reach the platform. Another maze type is radial arm maze, Vorhees, Charles and Williams, concluded that the radial arm maze had more flaws within it than MWM because radial arm maze is designed to have identical pathways emerging out of the center of the origin, if the pathway is not extremely identical and there are hidden cues (such as a small splash of color, a cut in the walls of the maze etc), those cues can be an influence on the rodent's ability to navigate the maze. Whereas the MWM had no cues inside the maze but the scientists or the researchers are the ones that provided the rodents with the cues such as light and sound etc. Their experiment concluded that rodents such as rats learned faster by having help from the cues and that the rats could learn from the MWM.

- Testing on the spatial memory of hamsters by setting up the radial maze with doors and food at specific arms. Hamsters were placed at the center of the maze with all arms closed. Then, after 10 seconds, all arms were opened and allowed it to explore the whole maze. The trial was repeated and this time, when the Hamster entered the baited arm, all arms closed. When it returned, all arms were closed for another 10 seconds and then all arms opened again. The result of this experiment shows significant improvement in male trials. The suprachiasmatic nucleus (controlling circadian rhythms) and the hippocampus, which are associated with learning and memory, are sexually dimorphic structures. The hippocampus of male is significantly different from that of female in terms of anatomical structure. This may cause the different learning ability in male and female. Furthermore, sex hormones such as estrogens, can alter the hippocampus activity, which may influence the ability of female rodent.
- At first, a radial arm maze seemed like the maze that was the most suitable to test the rodent's abilities in spatial and navigational skills because that was what researchers Olmstead and Kuhlmeier conducted within their experiments. But, not only the memory of male or female hamster will be tested, their navigation skill would be tested too so, a radial arm maze would not be ideal for the experiment that would be testing spatial and navigational skills as well as their memorization abilities.
- The radial maze only tests the rodent's short term memory. In order to save materials and time, the maze design must consider the rodent's memorization skills and their navigational specialties. The research by Olmstead and Kuhlmeier also stated that the increase in time a rodent confined in the center of the radial maze, the chance they are going to revisit the same arm would increase because of their beliefs that the food would be in that particular arm of the maze, where in fact they already ate it. This information would be used to create a maze that allows the rodent to enter from the center of the maze instead of having it enter from the sides like other normal open mazes. The flaws with having the entrance by the sides are that the rodent might not want to enter and would exit from the entrance.
- Then the rodent would follow the path around the starting point, then exit. Food would be placed along the maze, to test both their memory and navigation skills, the number or amount of food would decrease through time until one piece of food is left at the exit. Also, this experimental design does not create an atmosphere where the rodent would be put to stress; they are receiving the foods they love to eat and therefore, has motivation to complete the maze.
- In the experiment conducted, it could conclude that female Hamsters were faster at navigating the maze, however, our determined factors do not tell 100% that it is because the Hamster is a female, which is because there are less amount of subjects in the experiment, if there were at least 3 females, 3 male Hamsters, it could become more accurate in determining that the difference in gender and how their rate of memorization and navigation is better.

30<sup>th</sup> April

- There are 2 ways of navigation which is the allocentric and egocentric navigation. What allocentric navigation is, is that it is a spatial navigation where the learner is able to navigate their location by using external objects as a guide. Another way of navigation is egocentric where the animals are able to locate their locations or find the way out, in the dark. It was said that Hamsters would recognize the external objects in their path and they would be able to follow it to find their way out etc. It could be said that they use allocentric navigation.

29<sup>th</sup> April

- **If the hamster is scared it could freeze in place:** When they are afraid they might play dead by lying down and freezing in place. It would decrease the chance for the predator to attack which is why it freezes and looks dead, the predator could leave it alone.
- Operant conditioning works by implementing positive stimuli to the subject. Operant conditioning is often seen in classrooms, teachers will reward students that pay more attention in class or get high scores in an exam, with points or other rewards. This creates a feeling for the student to do good in class in order to receive the reward.

It would make students want to get good scores and pay more attention. This is an incredibly useful way to allow rodents to learn because the reward for the rodents could be their favorite food. They would have motivation to complete the maze and it might be able to complete the maze faster.

- There are 5 types of learning methods and they are 1). Flooding 2). Desensitization 3). Graded Exposure 4). Counter conditioning and 5). Graded Counter conditioning.

29<sup>th</sup> April

Hamsters are very emotional animals and lots of things can make them stressed. Even if causes are unknown, there are still some symptoms that should be looked out for: Decreased eating/ drinking, Fur loss, started being aggressive e.g. biting the owner, decreased wheel time and hiding and not coming out in normal times. If hamsters are stressed for a long time, stress could kill the hamster.

- To reduce the Hamster's stress and let them adjust to the new environment, hamsters should be left alone on the first few days because hamsters are stressed from leaving their group or their territories. Also, hamsters should be allowed to live their life cycle, which is awake during the night and sleep during the day. Hamsters need to live in ventilated areas, keep other animals away from them and in an environment that is quiet and has lots of different toys and treats.

29<sup>th</sup> April

- Literature review is a comparison between different experimental designs by different scientists where they conducted the experiment similar to what we are going to conduct. We can compare and contrast between many different experiments so that we could come up with an improved experiment of our own. We could also learn from the experimental flaws and implement our own so that the experiment conducted could prove our thesis or hypothesis by doing research. We could also learn which type of maze we want to create or make to test our rodent. We could also learn our experiment results beforehand therefore you could compare the results to our results. The experiment could confirm or disagree with the experimental design that was conducted by other scientists.
- The types of learning they tested on the rodents were 'Active Avoidance Learning', 'Passive Avoidance Learning', 'Memory and Memory Recall', 'Short Term and Long Term Memory', 'Conditional Learning' and 'Maze Traversing Ability, Maze Learning and Spatial Navigation'.
- This mimics their real life situations when they forage for food, to efficiently find food and even find mates, they must have good spatial learning and memory in order to find food faster and not enter the same locations they previously went because the food would not be there anymore (as they already foraged there previously). This is an important aspect to consider because rodents must have these abilities in order to survive.

1<sup>st</sup> May

#### Counter Conditioning

- Place your hamster's cage in a good location
- Give your hamster at least a few days to acclimate to their new surroundings.
- Approach hamster's cage with care because hamster will probably see human as a huge predator at first.
- Stand near the cage.
- Talking or making soft sounds can relax the hamster.
- Offering treats to the hamster, such as bringing them some toys.
- Hamsters will get stressed (Unconditional Response) if they are held by the trainers (Unconditional stimulus) at the first time, but will relax (Conditional Response) when they get food (Conditional Stimulus) or receive gentle care.
- With care, try to hold the hamsters on the hands, but don't force the hamsters, then give them a little piece of food every time the trainers hold the hamsters.
- Repeat step 4-5 for three times a day for three days or until hamsters voluntarily crawl to the trainer's hands because the hamsters would remember that trainers won't be harmful and care for them.

#### Desensitization

- When trainers use hands (Unconditional Stimuli) to handle the hamster, they might bite (Unconditional Response) trainers' hands.
- Slowly reach into their cage with both hands and let them walk in, hold them facing the caregivers.
- Try holding them for a minute or two initially, then slowly increase the amount of time each time. Do not let hamsters fall.
- After a few minutes, or when hamsters begin to get agitated, place hamsters back in their cage.
- Repeat the step 1 to 4 every day until hamsters get comfortable (Conditional Stimuli) with trainers (Now becomes Conditional Stimuli)

26<sup>th</sup> April – 10<sup>th</sup> May (Same information learned)

#### Sources:

All Science Fair Projects. (2014). Comparing the learning abilities of male and female mice. Retrieved from AllScienceFairProject: [http://www.all-science-fair-projects.com /project1128\\_78\\_1.html](http://www.all-science-fair-projects.com/project1128_78_1.html)

Elliott, M. P., & W. (2017, April 21). *How to Make Your Hamster Trust You*. Retrieved May 07, 2017, from <http://www.wikihow.com/Make-Your-Hamster-Trust-You>

Ellis, L., Hershberger, S., Field, E., Wersinger, S., Pellis, S., Geary, D., . . . Karadi, K. (2013). *Sex Differences: Summarizing More than a Century of Scientific Research*. Psychology Press.

Goldman, J. G. (2013, January 11). *What Is Classical Conditioning? (And Why Does It Matter?)*. Retrieved May 07, 2017, from <https://blogs.scientificamerican.com/thoughtful-animal/what-is-classical-conditioning-and-why-does-it-matter/>

Guo, R., Liang, N., Tai, F., Wu, R., Chang, G., He, F., & Yuan, Q. (2011). Zoological studies. *Differences in Spatial Learning and Memory for Male and*

*Female Mandarin Voles (Microtus mandarinus) and BALB/c Mice*, 50, 1st ser., 24-30. Retrieved May 8, 2017.

*How to lower hamster stress?* (n.d.). Retrieved May 04, 2017, from

<https://answers.yahoo.com/question/index?qid=20100816153956AA6kmaMUGGGGHG>

Levy, J. (2012, September). *Derek Lu: Investigating the Learning Pathway in Rodents*. Retrieved from Stanford:

[http://web.stanford.edu/group/journal/cgi-bin/wordpress/wp-content/uploads/2012/09/Lu\\_SpecFeatures\\_2010.pdf](http://web.stanford.edu/group/journal/cgi-bin/wordpress/wp-content/uploads/2012/09/Lu_SpecFeatures_2010.pdf)

Olmstead, M. C., & Kuhlmeier, V. A. (2015). *Comparative cognition*. Cambridge: Cambridge University Press.

Pirchl, M., Kemmler, G., & Humpel, C. (2010). *Female Sprague Dawley Rats Show Impaired Spatial Memory in the 8-Arm Radial Maze under Dim Blue and Red Light*. *International Journal of Zoology*, 2010, 1-8. doi:10.1155/2010/507524

*Science Fair Projects - Does a mouse smell or see better?* (n.d.). Retrieved May 04, 2017, from [http://www.all-science-fair-projects.com/print\\_project\\_1406\\_78](http://www.all-science-fair-projects.com/print_project_1406_78)

*Three Major Types of Learning* (n.d.). Retrieved May 07, 2017, from <http://faculty.washington.edu/robinet/Learning.htm>

Writer, L. G. (2016, October 10). *Hamster Anxiety*. Retrieved May 04, 2017, from <http://animals.mom.me/hamster-anxiety-1249.html>

W. (2017, May 07). *How to Build a Hamster Maze*. Retrieved May 07, 2017, from <http://www.wikihow.com/Build-a-Hamster-Maze>

*เว็บแรกที่คุณเลือก*, (n.d.). สวมสตอร์ กับเรื่องน่ารู้ก่อนนำหนูมาเลี้ยง. Retrieved May 04, 2017, from <https://pet.kapook.com/view92160.html>

