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11º IB Psychology

MOUSE IN THE MAZE

Lab Report

The need for rewards in order to make the hamster get to the end of the maze.

HAMSTER NAME (sample): Cornelio

Introduction

The objective of this project is to further develop our skills to elaborate psychological research and in this case, specifically by analyzing a rodent's behavior. As students taking the psychology subject, it is important for us to deeply understand how psychological research works, what does it imply, and of course to be able to gain knowledge from research made by ourselves.

We believe that conducting an experiment ourselves is the best and the most direct way to learn about behavior through psychology. Being able to manipulate the independent variable (rewards) and automatically seeing the hamster's response towards it allows us to see how significant is the role of rewarding someone in terms of its effectiveness to perform a task. This experiment consisted of teaching a hamster to find its way through a maze. There was a need for rewards in order to make the hamster get to the end. By this, we tested the hamster's ability to memorize how to get to the end and to the reward. Further, into our explanation, we are going to mention how many tests we did, our results and analyze and evaluate our experiment.

For this experiment, we evaluated the hamster's cognitive process. As seen in a study that is going to be mentioned further into our report, and a full explanation about why we use rodents to research the brain, there is a really good reason why making these types of experiments in rodents are so effective. Mazes have been tested and results say that the tasks that have to be done in them, feature both object recognition and operant responding. There have been a number of different tests made that test a mice's cognitive process and in the case of the first study, Radial Arm and Water Mazes, there were several variables and factors that changed. For example, the floors or walls could change for the mice to have a type of recognition task. These variables might be able to make the mice have an easier time recognizing these surfaces and getting to their objective. For this experiment, a water maze was developed in which spatial navigation, which is: "knowing where you are and knowing how to get to places that you need to get to." (Burgess, 2016) As well as memory could be tested by controlling the food and water given to the mice.

The trail for this experiment lasted between 4-10 testing days, with 2-4 trials per day. Since the maze was easy to memorize, what scientists tested here were two different types of learning systems: day to day acquisition tasks and spatial memory. The mice tested were able to complete the initial task. (Mark D. Linder, … Piere N. Tariot, 2008)

Explanation of why we use rodents to research the brain

An extensive amount of research and studies make use of animals, specifically of rodents. According to Andrea Chiba, professor from UC San Diego, this is due to the fact that "...a lot of the structure and connectivity that exists in human brains also exists in rodents…". Also, another similarity between humans and rodents is that they tend to be very social, whether it is with a group of rodents or even with humans. Similarities such as the ones above are what make studies use rodents when studying human behavior or the human brain. This is why, to an extent, behavioral studies in rodents can be generalized to the study of human behavior.

Besides the shared similarities between rodents and humans, there are more reasons that make rodents beneficial as the sample in a study. Rodents have shorter lifespans than humans do, which makes it profitable for scientists since they are able to make longitudinal studies in a fast way as well as study them throughout various generations.

Finally, rodents are considered animals that are easy to train. They have the ability to quickly learn tricks, behaviors, routines… which makes it a lot easier in the procedure of the experiment. Therefore, according to this data, rodents won't find it hard to learn a maze.

The hypothesis for this experiment is the following, "The hamster will take time to get used to the new environment and might take up many trials before the hamster learns the way out. We also believe that food will be a big influence on the process in the way that it will make it faster. In terms of time, we believe that it will decrease in each trial since the hamster will have more experience, memory, and rewards each time." As the experiment is deepened, the hypothesis is going to be proved right or wrong.

Exploration

To have a successful experiment, the use of independent, dependent, controlled, and extraneous variables were measured and evaluated.

Independent variable	**Amount of rewards given**
Dependent variable	**Time/amount of trials it takes the**

	hamster to learn and get to the end of the maze
Controlled variables	**- The shape of the maze** **- Environment the hamster lived in**
Extraneous variables	**- The hamster's memory retention** **- The hamster's previous experiences (traumatic?)** **- The significance given by the hamster towards the reward (food).**

Our independent variable for this experiment is the amount of rewards given to the hamster. We decided that the way in which we would reward our hamster was by feeding him treats and placing them throughout the correct path of the maze in order for him to learn the way out. Each trial, we planned on giving the hamster a smaller amount of rewards in order to see if he could memorize the path by himself.

Our dependent variable was the time or the number of trials it took for the hamster in order for him to be able to complete the maze by himself, with no need for rewards.

The controlled variables were the shape of the maze and the environment in which he was kept in. We decided to create a rectangular maze because this was also the shape of his cage. We believed that a rectangular maze would create a familiar and safe environment for the hamster, in which he would feel safer. The hamster was kept in a large cage with toys, food, water, and a place to hide. After doing some research, we concluded that all of the things mentioned previously were essential for the hamster to live a healthy life, as well as to adapt faster to his new home.

During this experiment, we faced many extraneous variables, which included the hamster's memory retention, his previous experiences, and the significance that the rewards had towards the hamster's performance. None of the previous variables could've been known, for example, the hamster could have suffered a traumatic experience in his past habitat. These variables could affect the overall results of the experiment, due to the fact that we had no knowledge about them.

Materials

- Carton box
- Silicone
- Tape

Our maze is made out of a carton box and the trails are made with cartons as well and are pasted with silicon. We decided to re-use these materials so we didn't contaminate, and produce more waste. We found that they were very useful since the material is strong enough to stand up and not fall down easily.

Procedure and maze design

We based our maze on a model that we found on the internet with a good reputation and reliability. We made some changes to the existent model, and we modified the size and some trails for it to fit on the carton box and for it to have better pathways.
First, we grabbed the carton boxes and measured them. It was essential to see first the size that would be best for the hamster to travel through. As we decided on the size, then we traced the way the maze would go. After finishing that part, we started cutting the other part of the carton boxes and measuring them for them to fit the right way. As we finished that, for last we used silicone and tape to build the maze.
The design that we created for our maze wasn't too complicated so the hamster didn't feel overwhelmed. We decided to create a rectangular shape because it is the same as his cage, so this way he would feel more familiar and safe in the maze. This design consisted on only one correct path, so that the hamster didn't get confused.

Ethical considerations

In order to prevent suffering, ethical considerations in animal studies are essential. Animals have an intrinsic value which must be respected. They have the capacity to feel pain, stress, among other things therefore taken in consideration.

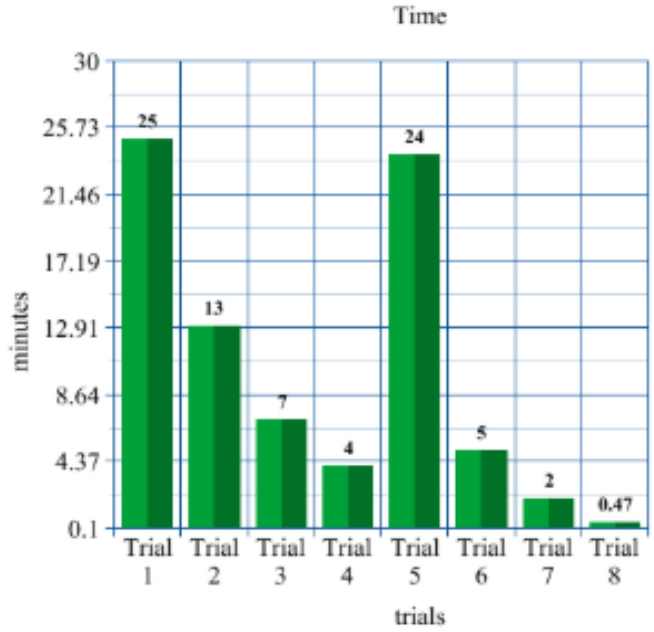
We treated him as well as possible since it is a small animal which needs to have a certain care, they have to be managed in a certain way for the to not get harmed in any way.

Due to the fact that our experiment was managed to work with a hamster which is a living being, we had to consider certain ethical considerations since we could not let the hamster be mistreated, cause the least stress possible, keep it in a safe environment, have it well fed, among many other things. We bought him a cage with 3 floors, which include 2 “hiding” spots to keep him warm, water container, food container, and a wheel for him to play. We fed him between 10 - 15 g of food.

Even though we tried to have the best environment for him and treated him as good as possible, he found a way out. Cornelio escaped from his cage, we are not exactly sure when he left the cage, but we think it was on february the 16th, with just 8 days of trials and 11 days within the experiment.

Analysis

The mean for the time we took for each trial was of 10 minutes with 125 seconds during the experimental conditions. The Standard Deviation is, s: 9.5981769102262



This graph is a visual representation of the time that the hamster took to complete the maze in each trial. As we can see, from the first trial to the 4th one, the time starts to reduce in an exponential way. However, in trial number 5, the hamster takes a very long time to complete the maze. This was the trial in which we gave the

hamster no reward at all. In trial 6, we rewarded the hamster again, making him complete the maze faster, and the time continued to reduce exponentially from then on.

By interpreting the graph, we can assume that the hamster remembered the maze in a more efficient way each time, but only if we rewarded him. However, due to the fact that our experiment was inconclusive, we can't be certain of the results.
As we mentioned before, our hypothesis consists on the hamster taking time to get used to the new environment and might take up many trials before the hamster learns the way out. We also believe that food will be a big influence on the process in the way that it will make it faster. In terms of time, we believe that it will decrease in each trial since the hamster will have more experience, memory, and rewards each time.

Due to the fact that our subject unfortunately passed away, we were not able to conclude the experiment, leaving our hypothesis inconclusive. We weren't able to prove it right nor wrong, however, by analyzing the trials that were completed, we can observe that each trial, the hamster completed the maze in less time and with less rewards. This leads us to think that if we had concluded the experiment, our hypothesis would be proven right.

Trails:
To be able to get accurate results, a number of trails had to be made with the hamster, for it to memorize its way through the maze.

Trial	**Description**	**Time**
1 **(day 1)**	It was the first time the hamster experienced the maze. He was confused and he didn't know what to do in order to get out. We noticed he was nervous since he popped all over the maze. He stayed in the corner where we left him and scratched the maze attempting to get out.	25 minutes

	There was no food as a reward involved in the first trial.	
2 **(day 2)**	The hamster was afraid of the new environment and tries to get out of the maze by attempting to climb the walls. Once we started leaving rewards throughout the maze, the hamster started moving but at a really slow pace. A good amount of rewards were used.	13 minutes
3 **(day 3)**	Hamster moved much faster. Still confused on the way out of the maze. Less afraid. A continuous trial of food was required to get him back on track.	7 minutes
4 **(day 4)**	With a very small amount of food, the hamster managed to get to the end. It did not take the hamster long at all. The hamster deviated a little into the incorrect paths but by himself, he managed to get back to the right way to the exit.	4 minutes
5 **(day 7)**	We didn't give food to the hamster during this trial. We thought that he would've known his way out by now but we were wrong. The hamster took a long time to get to the end of the maze, and he	24 minutes

	got very confused throughout the trial.	
6 **(day 8)**	In regards to the result of our last trial, we decided to reward the hamster again, to see if his performance would be better. By placing small amounts of food throughout the maze, the hamster got to the end with no trouble at all.	5 minutes
7 **(day 10)**	In this trial, we placed a smaller amount of rewards throughout the maze. The hamster got to the end very fast.	2 minutes
8 **(day 11)**	We placed the same amount of food throughout the maze as the last trial, to see if the hamster could get to the end faster. This was the time in which the hamster did his best performance, completing the maze in a very short amount of time.	47 seconds

Our hypothesis was that throughout the tials, the hamster would use more his memory, rather that the rewards themself. At the end, the hamster was supposed to get to the end of the maze by using his memory and his sense of smell, because only one seed was going to be placed at the very end of the maze. Unfortunately, due to experimental mortality, we weren't able to test our hypothesis. However, by the progress that the hamster made in each trial, we can assume that each time his memory of the way out of the maze improved, as well as his dependency for rewards reduced.

Evaluation

Based on the studies that were mentioned earlier, in comparison with our own experiment. We can say that there are many factors to consider when treating with rodents. It's important to mention how there are many variables possible to consider

when doing an experiment as this one. Just as mentioned in the Radial Arm and Water Mazes. There are always going to be a list of variables to work with, depending on the thing that you are trying to achieve with the experiment. As well as there are always going to be different goals to achieve regarding the rodent and its different abilities of cognition.

The reason why it is so important to know why we use rodents to research the brain is to make clear an experiment that uses them and to make sure you have an actual justification for doing a study that needs an animal as this one. Also, it's important to mention, that as explained before, according to Andrea Chiba, professor from UC San Diego, "...a lot of the structure and connectivity that exists in human brains also exists in rodents…". Which is very helpful when doing a study or any type of experiment that involves rodents.

Strengths

- We designed a simple, yet useful maze. It was not that big, so the hamster could get a chance to adapt easier and get to its target. The walls were firm and well structured, which was very helpful so there wasn't any kind of malfunction when testing the hamster inside of the maze.
- The hamster was well-nourished at all times.
- According to the findings extracted from this experiment, they could be somewhat generalizable to humans since we have common genetical information.

Limitations

- Experimental mortality: we couldn't complete the trials in order for our experiment to succeed. The results were inconclusive.
- Our hamster came from a pet store in which he lived with approximately 20 other hamsters. By being away from his usual environment and by himself, our hamster could've had a different behavior, maybe one that didn't cooperate with the requisites for the experiment.
- The environment the hamster lived in might have not been the most suitable. Having to live in the same place as many cats, dogs, birds… Might have caused the hamster some stress, discomfort or fear at any time through the experiment.

Modifications

- Due to the fact that our experiment ended as experimental mortality, we would have reconsidered if keeping the hamster in a household with many cats, dogs, and birds was the best idea in terms of safety. We concluded that the hamster lived in a high-risk environment.
- After analyzing all our trials and clearly seeing that the hamster had a memory regress due to the interrupted continuity of every-day-trials, it would have

been better if we kept the every-day streak. Interrupting the hamster's adaptation to its new routine might have been a distraction that caused the hamster to relearn the right way of the maze.

- The planning of the experiment consisted of us giving the hamster a smaller amount of rewards each time, however, as we noticed that each time he completed the maze faster, we decided to have a trial without any rewards, which resulted in the hamster forgetting the way out. This interrupted the hamster's memory and he had to get more rewards the next trial.

Conclusion

To conclude, throughout this experiment we were able to observe the differences and similarities about how rodents behave in comparison to humans, due to our similar brain structure and genetic similarities. By observing our hamster complete the trials, we were able to learn more about how roents behave, especially to the correlation between memory and rewards. Even though our experiment was inconclusive, we were able to observe a clear connection that the hamster made with the rewards that he received and the agility in which he completed the maze. We noticed that each trial, he wasn't very dependant on the rewards, rather than his own memory connections. By this, we were able to make a generalization, to an extent, that humans react similarly to the way that rodents do in regards to rewards and the use of memory. Overall, if we had completed our experiment, we would have been able to obtain more concrete results, as well as an answer to our hypothesis. However, from the few results that we obtained, it is clear that hamsters associate memory with rewards, in the same way that humans may do.

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