Investigating animal behaviour
Practicum

Human and animal behaviour is regulated by genetically determined, different nervous and chemical factors acting at the level of body organism. Inherited regulatory mechanisms only, however, would not be able to adapt to the continuously changing surroundings. Therefore, adaptive functions, such as learning and memory, are needed in order to continuously adjust behaviour to the requirements determined by natural and social environment. The inherent, overwhelming learning capacity of the brain enables us to recognise and understand the different tasks of different enviromental challenges, and learn/produce the most appropriate answers.

The primary regulatory system for animal behaviour is based on the motivation, inner drive and emotions of the animals. Learning and memory, on the other hand, represent the secondary regulatory system, which is built basically on the primary influencing factors. During the practicum, several tests on animal behaviour and learning can be carried out.

The effects of new environment on animal behaviour
A sudden, new stimulus triggers automatically a defined serial of behavioural patterns, even if the stimulus originates from the animal’s natural surrounding. The first component is the startling reaction, when the animal „freezes” for a while due to the unknown situation. The secondary answer is the explorative reaction, during which sensory attention is turned towards the stimulus in order the explore it and to orientate its significance. The stimulus can be either „attractive”, tempting for closer examination, or can be „repellent”, frightening, leading to escape. The significance of the explorative reaction is clear: the animal must find out the most suitable behavioural answer to the altered situation. Fear and anxiety are the 2 strongest inner drives behind exploration, but curiosity can also participate to a certain extent. Understanding te basic „coreography” of basic orienting and explorative behavioral elements are indispensible during behavioral tests.

Task 1: The Open field test
The open field must be illuminated evenly, and surrounding noise should be minimized. The field is divided into numbered squeres (5x5 quadrants), which can be used to follow the animal's movement inside the experimental field. A laboratory rat should be placed in the middle of the field, and its activity and behaviour must be examined during a 5-minute interval. Record the basic elements of animal behaviour in the order as they happened, and write down the number of those quadrants which the animal visited during exploration. The basic elements are:

- walking (W)
- sniffing (S)
- prancing (P; standing on the rear legs)
- immobility (I)
- movement on the spot (M; neither of the legs is put aside, the animal is „stamping”)
- self-grooming (G; cleaing itself, scratching)
- other (O; record any other element)

The order of the different behavioural elements should be recorded. In case of walking, the direction can be followed by observing and writing down the number of the quadrants
the animal visited within the box. Thus, after 5 minutes, a similar recording can be obtained:

   e.g. G, P, S, W1,2,8,9-13, S, P.... etc

Analyse the main characteristics of the animal's behaviour, including the most frequent behavioural elements and the main walking pathways! Where did the animal spend the most time during the first and second half of the experiment? Did you observe any changes between the different behavioural elements, depending on the length of time the animal spent in the box? Try to explain your findings!

**Task 2: Testing the interactivity effect / social relation on animal behaviour**

After having investigated a laboratory rat in the open field for 5 minutes, place an other (naive) rat into the box. Follow the behaviour of both animals for additional 5 minutes, as indicated above.

Compare the behavioral elements of the two animals, depending on whether it was the new one, or that one which already had the opportunity for previous exploration. Record and analyse in your lab report how the animals reacted towards each other, too. Discuss whether any new elements appeared in the behaviour of either of the animals.

**Investigating animal learning and memory**

**Task 3: Learning spatial direction in a labirinth**

Rodents are especially good in finding their way in tunnels, tubes, etc. Besides simple curiosity, hunger or thirst will motivate the animal even more to explore an unknown labirinth. Strong motivation will increase the ability for learning, too.

Clean the inner surface of the labirinth with ethanol in order to remove the smell of previous animals. Make a basic outline of the labirinth in your lab book where you can also record the track of the mouse during the tests. Put some „rewards”, thus food, at the exit in a small cage.

Place one hungry laboratory mouse in a small cage to the entrance of the given labirinth and record the way it makes through the labirinth and also the time needed for the run. Observe whether the animal entered some „dead-ends” and how long it took for it to recognize the wrong way. Once the animal reaches the reward, do not let the mouse consume the whole piece (otherwise the animal will lose motivation to find the reward)! Place the animal back to the entrance and start the test again. Repeat the tests until the time needed for the complete run is not decreased any more.

In your lab report, make a drawing of the labirinth, and indicate the different routes made by the animal during the different testings. Give also the time needed to reach the reward during the consecutive tests. Could the animal find the shortest way to the food? Could you observe any alterations in the animal’s behaviour during the consecutive tests? Was the animal able to learn the route and reach the reward fast?
Task 4: Learning the direction in a Y labirinth:

The Y labirinth is composed of 3 similar arms, which are distinguished by the different coloured spots at their beginning. Rodenst are very good at learning and sensing different directions, which can be tested by this simple equipment. The main task is to teach a thirsty rat to learn the correct direction (left side or right side) in order to get a drop of water.

Clean the labirinth with ethanol, and decide which direction you want to teach to the rat (e.g. right side). Place one drop of water at the edge of one arm, then place a thirsty rat in the middle. The rat will run immediately into one of the arms. Once it happen, close the arm behind the animal with the plastic stick. If the rat run into the arm which contained the water, let it consume. If not, wipe off the drop of water, then place a new drop of water into that arm which is to the right to that arm where the rat run into. Once it is ready, lift the plastic stick and let the rat enter another arm. In case the rat enters now the arm to the right, let it consume the water. If the rat chose the left arm or went back to the original arm, close the way behind it, wipe off the water and start again by putting a drop of water into the arm located to the right of the animal. Repeat the whole procedure until the rat learns that it has to go to a certain direction in order to get the water.

In your lab report, include the individual choices made by rat, from one session to the other. Give the time needed for teaching the correct direction! Once the animal has learnt the task, try to change the direction and observe how long it takes for the animal to get accustomed to the new requirements.

Task 5: Operant conditioning

In associative learning, the animal makes a connection through its behavioural response between a neutral stimulus and a second stimulus that is either a reward or a punishment. In the classical conditioning, the animal is a passive participant. By contrast, an animal may be asked to learn a task or solve a problem. Since the animal learns to solve the problem and get the reward – or avoid the punishment – by operating on its environment, it is called operant or instrumental conditioning (this experimental method was introduced by Thorndike in 1898.) The main task is to teach a thirsty rat that it has to push a pedal in order to get some water.

The equipment (Skinner box) is a box where the animal has to be put inside. There is a pedal in the front part, which can be easily pressed by the rat's paw. Next to it, some water can be added by manually raising a small spoon out of a water-filled petri dish.

Place the animal into the box and cover it in order to have less light inside. Let the animal explore the new surrounding for a while. Record the number of any spontaneous pushes on the pedal. After a few minutes, try to draw the animal’s attention to the pedal, and also, try to make it understand that water can be reached from the spoon. Once the animal knows where to obtain the water from, try to teach the animal to make a connection between pushing the pedal and getting some water. If the animal fails to connect the task with the reward, you can try to put a drop of water directly onto the pedal. Be patient, teaching can take up to 1 hour!!! (This experiment measures not only the ability of the rat for operant conditioning, but also your ability/patience for teching!)

Include your observations and impressions during the test, and explain the rat’s behaviour.