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Review Article

Evaluation of memory enhancement activity of rodents in spatial arrangement by using Labrynth maze

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ABSTRACT

Spatial memory, according to neuroscience, is the part of memory responsible for recording one's environment and its spatial orientation. Memory is one of the complex functions of the brain. It ultimately involves multiple neuronal pathways and neurotransmitters. Cognitive disorders like Alzheimer's disease, amnesia, delirium, depression and schizophrenia are the results of impairments in learning and memory. All these diseases have a huge burden on society and their prevalence is still growing. Learning is a process of acquiring knowledge about the world and memory is its retrieval. Spatial memory is highly relevant in biology because it is related with both individual and species survival. Among behavioral tests, one of the most suitable devices for measuring spatial learning and memory is the Labrynth maze.

Key words: Spatial memory, Labyrinth maze, Memory enhancement, spatial arrangement

1. INTRODUCTION

TheLearning or acquisition, a highly specialized function of the brain, is a process of acquiring knowledge around the organism, while memory is the storage or retention of learnt knowledge which can be retrieved later. In the process of learning or acquisition, activation of neurons occurs in specific areas or specific memory systems of the brain concerned with the processing of the specific modality of sensory information. Physiologically, memories are caused by changes in the capacity of synapses to transmit activity

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from one neuron to another in a neural circuit as a result of previous neural activity; these changes in turn establish new pathways to develop in the neural circuitry. The new pathways are called memory traces. They are important because once established, they can be activated by thinking process to reproduce memories whenever required[1]. The human brain is almost certainly the least understood of our organs. When facing the diseases affecting the brain, the medical sciences are in an unfortunate situation of studying and attempting to prevent/cure unknown pathological processes where even the normal conditions are poorly understood. On this back ground, numerous diseases are in a desperate need for an improved understanding and more adequate methods of intervention. Alzheimer's disease, primarily affects the elderly population, and is estimated to account for 50-60% of dementia cases in persons over 65 years of age. There is some evidence that aged organisms have impaired memory function. For example, in humans, performance on recent memory tasks appears to decay at shorter training-test intervals and is more susceptible to retroactive interference in elderly subjects than in young adult subjects. Recent memory also appears to be deficient in aged non-human primates[2]. There are reports that administration of cyclosporine in chicks produced cognitive deficits[3]. Immunosuppressant induced by virus in mice impaired learning and memory process[4]. Similar cognitive impairment was also observed in patients following cyclosporine administration[5].

Memory is ability of an individual to record event, information and retains them over short or long periods of time and recalls the same whenever needed. Age, stress and emotion are conditions that may lead to memory loss, amnesia, anxiety, high blood pressure, dementia, more ominous threat like schizophrenia and Alzheimer's diseases. "Nootropics" are agents that enhance the cognitive skills. Learning and memory can be conceived as both a psychological process, as well as a change in synaptic neural connectivity. Cognitive deficits have long been recognized as severe and consistent neurological disorders associated with numerous psychiatric and neurodegenerative states[6].

Equipment Labyrinth maze

Animals used Sprague Dawley/Wistar rats, Swiss Albino mice

Purpose and Activity

The mazes are used mainly to measure the intensity of the spatial memory by comparing with standard drugs of memory suppressors and also memory enhancers. Many new drugs like synthesized products and other herbal extracts are used for the testing of memory enhancement activity.

2. LABRYNTH MAZE

Labyrinth maze is another best known device for studying the learning, remembering (memory) and reasoning in animals.Labyrinth maze contains channel or tunnel which is formed by number of Y figures for exploring by the animals like mice and rats the mazes are connected alternatively opposite to each other in a continuous line and ending of maze is li ke cone shape

Fig 1: Labrynth maze (Top view)

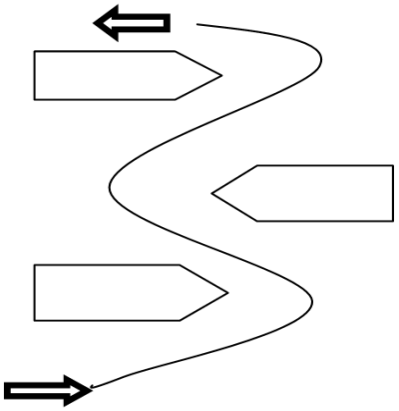

Fig 2: Direction from chamber A to B (Destiny)

(Picture from Pharmacology Research Laboratory, Chalapathi Institute of Pharmaceutical Sciences, Guntur)

To a maximum 5 stages of mazes are present and are arranged in a **zigzag** position. Each stage was about 30cm long and 15cm wide. The top roof of apparatus which covers the mazes is about 60cm wide & 55cm long. As similar to that of the rectangular maze, the labyrinth maze consists of 3 chambers.

1) Chamber-A in which rat is placed. It has a sliding door that is opened to allow rat to enter maze.
2) The maze (chamber-C) the animal has to explore.
3) Chamber-B at other end of the maze in which the reward is kept.

All these divisions of maze are hinged separate. Top lids 50 as to maintain a uniform environment inside the maze and prevents any land of outside stimulus or clue to be delivered to the animal.

An electrical system provides indication when the rat is placed in chamber. The chambers A and B has tapping sensor plates and when a rodent enters into it the time not will be observed on the digital displays and light blinks at the indicator showing the presence of animal.

Fig 3&4: Digital count screen and electrical indicator for showing animal presence

(Pictures from Pharmacology Research Laboratory, Chalapathi Institute of Pharmaceutical Sciences, Guntur)

Procedure

- Group of rats are trained on equipment to perform the pharmacological activity.
- First close the slide door connecting to chamber A to maze.
- Place the animal in chamber A, then the A indicator glows and display shows ready.
- Close the top lid of all three components; leave the apparatus as such to let the animal acclimatize to environment inside the maze.
- After allowing sufficient time to the animal to get used to environment, open the slide door.
- The “A” light will go out as soon as the animal leaves the chamber and moves into the maze. Simultaneously the “C” light will start to glow and counter will start counting the time elapsed in seconds.
- The counting will stop and the C indicator light will go out as soon as the animal enters the end compartment i.e. chamber B and the B indicator glows.
- The B indicator indicates that the animal has reached the end compartment and the completion of the experiment (the reading recorded on timer will be total time taken in seconds, by the animal in traversing).

3. EVALUATION

The reading recorded on timer will be total time taken in seconds by the animal in traversing the maze as similar to that of the rectangular maze

Table 1: Evaluation of memory enhancement activity on different treatment groups.

S.No	Group	Treatment	Learning Scores (Time in Sec)				Avg Time (Sec)	Mean± SEM
			Day 1	Day 2	Day 3	Day 4		
1	I	**Control**	52	50	46	41	47.25	47.25±2.42
2	II	**Diazepam**	59	56	56	53	56	56±1.22
3	III	**Piracetam**	39	36	36	34	36.25	36.25±1.03
4	IV	**Piracetam + Diazepam**	54	51	45	43	48.25	48.25±2.56

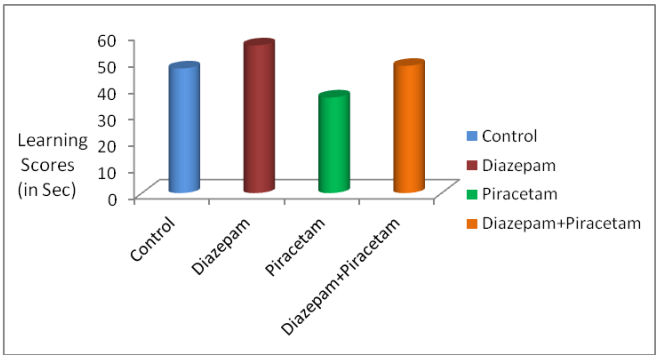

Fig 5: Screening of learning scores (sec) from Chamber A to B (Destiny)

4. CONCLUSION

Making the animal to train on the apparatus daily, gives better results as the animal acclimatize to the conditions of the experiment and results in better evaluation of drugs. Therefore day by day scores will differ to the same animal and the average score was calculated for comparing in between the drugs.

The time of the learning scores of piracetam was less than all the other used groups i.e. the group of animals used with the piracetam reach the destination quickly from A to B when compared with the other drugs. The fourth group i.e. the group which is pretreated with piracetam before the administration of diazepam shows better activity than the diazepam administered alone.

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