

# **Enhancement of adult hippocampal neurogenesis by spatial memory training and its effect on the maintenance of cocaine-contextual memory**

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## **Abstract**

### **Aims**

Modulation of hippocampal memories related with cocaine addiction such as cocaine-context associations could have important clinical implications. It has been asserted that learning-related experiences promote hippocampal plasticity enhancing adult hippocampal neurogenesis (AHN). Here we aimed to evaluate (1) the stimulation of AHN using a spatial learning task dependent on the hippocampus and (2) whether spatial learning reduces the long-term maintenance and reinstatement of previously acquired cocaine-associated contextual memories.

### **Methods**

Male C57BL/6J mice were first submitted to a cocaine induced conditioned place preference paradigm (CPP). Then, bromodeoxyuridine (BrdU) was administered in order to label newborn neurons. One week after the last BrdU injection, a group of mice were trained in a spatial learning task using the Morris water maze while control animals received a non-hippocampal training or stayed undisturbed in their home-cages. Twenty seven days after conditioning, mice were tested for CPP retention and extinction. Finally, a cocaine priming-induced reinstatement of drug seeking was performed.

### **Results**

Animals trained in the spatial learning task exhibited a lower long-term CPP retention memory. In addition, cocaine-induced CPP reinstatement was attenuated in trained animals. Immunohistochemistry showed an increment in the BrdU+ cells in the hippocampus of trained animals in contrast with control animals.

### **Conclusions**

Spatial memory training using the Morris water maze constitutes a tool to promote the survival of newborn neurons in the hippocampus. Furthermore, stimulation of AHN might be a neurobiological mechanism by which spatial learning reduces the long-term maintenance of previous cocaine-context associative memory. *Supported by PSI2017-82604 (MICINN Spain); PSI2015-73156-JIN. Universidad de Málaga.*