

Learning deficits in mice with hippocampal lesion in the IntelliCage

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With increasing number of genetically modified mice, the refinement of existing behavioural tests is required. The IntelliCage has been invented for monitoring different aspects of mouse behaviour living in social groups with minimal human interference. IntelliCage consists of 4 learning corners, where drinking is possible. Time and place of access to water can be individually programmed. The C57BL/6J mice with bilateral excitotoxic lesion of the hippocampus (HIP) or sham-operation (CON) were used for validating several learning tasks in the IntelliCage. The following experimental designs were applied: adaptation to drinking sessions (two 1-hour sessions during dark phase), place preference learning and reversal, serial reversal (new correct corner assigned for each session), patrolling (correct corner moved to the next position by one step after correct visit), and chaining (correct corner moved to the next position after each visit). The HIP mice showed impaired adaptation to the fixed schedule of drinking sessions that persisted throughout the testing period. It may be seen as an equivalent for behavioural disinhibition. Place preference learning was faster in the HIP mice, probably due to the fact that they showed less alternation already during early adaptation. Impaired flexibility was evident in the early phase of reversal. More pronounced impairment was found in the serial reversal experiment. However, with prolonged training the difference between HIP and CON mice disappeared. Patrolling and chaining revealed significant impairment in HIP mice. A common finding in all modules was the transient hyperactivity in HIP mice in response to changed rules. Duration and magnitude of hyperactive reaction depended on the complexity of the task. In summary, the set of learning tasks presented here may be taken as a battery for fast and reliable screening of mouse models for hippocampal deficit.

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