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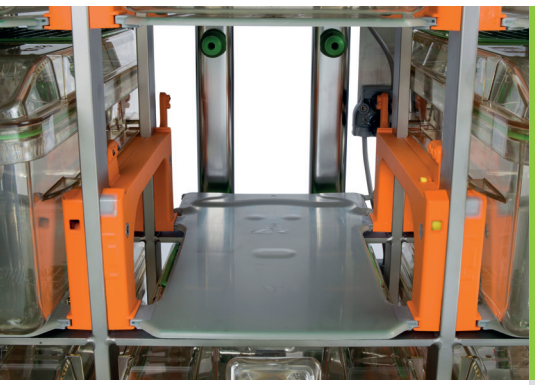

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SCAN ME

FOOD AND WATER RESTRICTION LEAD TO DIFFERENTIAL LEARNING BEHAVIORS IN A HEAD-FIXED TWO-CHOICE VISUAL DISCRIMINATION TASK FOR MICE

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BACKGROUND AND AIMS

Head-fixed behavioral tasks can provide important insights into cognitive processes in rodents. Despite the widespread use of this experimental approach, there is only limited knowledge of how differences in task parameters, such as motivational incentives, affect overall task performance.

MATERIAL AND METHODS

In this study, we provide a detailed methodological description of the setup and procedures for training mice efficiently on a two-choice lick left/lick right visual discrimination task. We characterize the effects of two distinct restriction regimens, i.e. food and water restriction, on animal wellbeing, activity patterns, task acquisition, and performance. Four weeks before starting food or water restriction, C57Bl/6j mice were transferred from a local animal breeding facility into individual 24hr/day activity monitoring cages (DVC®) that were kept in an animal holding room with a reversed day/night cycle for an adaptation period of 9 to 10 days before starting the experiment.

RESULTS

While we observed reduced behavioral activity during the period of food and water restriction, the average animal discomfort scores remained in the `sub-threshold' and `mild' categories throughout the experiment, irrespective of the restriction regimen. We found that the type of restriction significantly influenced specific aspects of task acquisition and engagement, i.e. the number of sessions until the learning criterion was reached and the number of trials performed per session, but it did not affect maximum learning curve performance. Continuous home-cage activity recordings allowed us to monitor both the acute and long-term effects of restricted access to food or water. Across the entire duration of restriction, both food- and water-

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restricted mice showed reduced activity in the (active) daily light-off period (10:00±22:00, excluding the period during which training was typically done), as compared to their respective baseline levels before restriction had started. Finally, in the post-restriction period, during which food and water was available ad libitum again, the average daily activity returned to levels that were comparable to the pre-training baseline. Thus, by using continuous home-cage recordings we observed that food and water restriction induced a reversible reduction of overall activity levels that went undetected using the instantaneous scoring method.

CONCLUSIONS

Results indicate that the choice of restriction paradigm does not strongly affect animal wellbeing, but it can have a significant effect on how mice perform in a task. Moreover, we showed that the use of a continuous home-cage monitoring system allows expanding the quantification of animal wellbeing to include an objective measure of overall activity, which allows observing light-cycle adaptation, post-surgery recovery and effects of food and water restriction without disturbing the animals