

Choice control assessed by automated delay discounting tasks in the social home cage

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Delay discounting tasks (DDTs) assess impulsive choice (cognitive impulsivity) with comparable outcomes in humans and animals by letting subjects choose between an immediate but small reward and a larger but delayed reward. Existing DDTs for mice require social isolation and food or water deprivation. Our aim was to develop a DDT for the IntelliCage, a fully automated cage where mice can be group-housed but singly tested and where no prior deprivation is needed.

We first implemented DDT based on the choice between an immediate water reward and a saccharin reward available at increasing delays (0-15s). Testing of C57BL/6 mice produced the expected hyperbolic discounting function. However, functions of other strains were biased by a reduced preference for saccharin. This bias was minimized in DDT variants based on choices between water and sucrose or between short and long access time to water. We further tested mice with hippocampal or cortex lesions in the water-saccharin DDT. The discounting functions of these mice were unexpectedly shifted towards longer delays. However, in an aversively motivated variant of the task, using a choice between quinine and water, their discounting curves were normal, indicating that the lesions are probably associated with poorly controlled responses to reward rather than increased delay tolerance.

Together, our results indicate that delay discounting in mice can be tested in a social environment and without prior stressful deprivation. The combination of appetitive, aversive and size rewarded DDT permits to dissociate changes of delay resistance from altered response to reward.