

Assessment of impulsivity and attentional performance in IntelliCage

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Introduction

- Attentional impairments and impulsivity appear across several neurodegenerative disorders.
- In previous research, C57BL/6 and DBA/2 mice have been found to differ in attentional performance level in serial reaction time task (SRTT).
- The aim of the study was to develop a new procedure which assesses impulsivity and attention of socially housed mice using the fully-automated testing device IntelliCage NewBehavior AG (www.newbehavior.com).

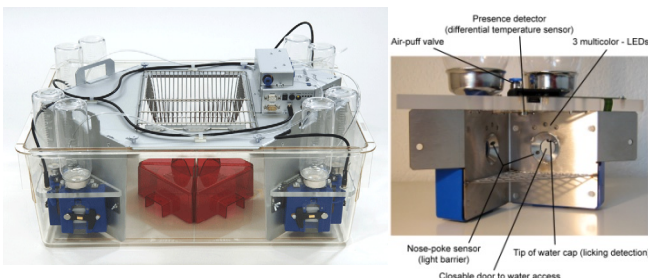


Figure 1. The IntelliCage.

Methods

Animals

- 24 virgin females, 29 weeks old at beginning of the experiment. 12 B6: C57BL/6NCrI, 12 D2: DBA/2NCrI
- Mice were tested for 54 days in the IntelliCage. Two IntelliCages were used where 6 females of each strain were housed (12 animals per cage). The animals were already habituated to the cage.

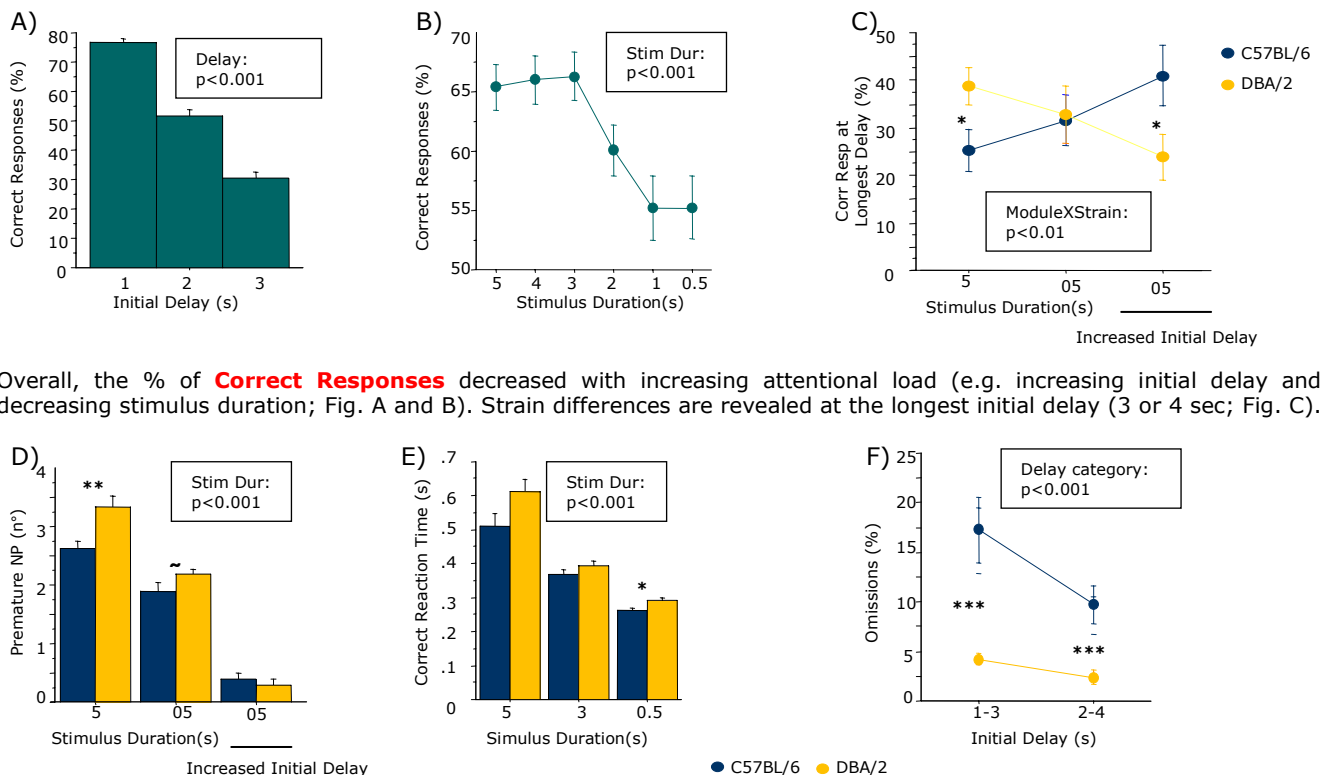
Experimental protocol

In the protocol, the mice were allowed to drink in each of the four learning corners upon a nosepoke (NP) made during a light stimulus. This stimulus consisted in turning on 3 yellow LEDs above each nosepoke hole at a random delay (1-3 sec) from the start of the corner visit. Following an initial training phase, the stimulus duration progressively decreased from 5 to 0.5 sec. A premature NP (e.g. NP made before the onset of the stimulus), prevented the light to turn on and therefore the access to the water. Finally, the attentional load was increased by increasing the initial delay to a random value between 2 and 4 sec.

Variables

- Correct Response:** First NP of the visit made during the stimulus.
- Premature NP:** number of NP made before the stimulus.
- Correct Reaction Time:** latency to correct NP
- Omission:** visit with light stimulus but without response (NP)

Results



Overall, the % of **Correct Responses** decreased with increasing attentional load (e.g. increasing initial delay and decreasing stimulus duration; Fig. A and B). Strain differences are revealed at the longest initial delay (3 or 4 sec; Fig. C).

The number of **Premature NP** (Fig. D) and **Reaction Time** (Fig. E) values decreased with increasing attentional load and were higher for DBA2 than for C57BL/6. The % of **Omissions** (Fig. F) decreased with increasing initial delays in both strains. However, C57BL/6 showed a much higher % of Omissions than in DBA/2.

Conclusions: our results confirm previous findings showing that both strains are able to perform the task and that strain differences appear at the high attentional load with C57BL/6 mice performing better than DBA/2. IntelliCage may be therefore be used to assess impulsivity and attention in different strains in a more automated and less time-consuming manner.