Strategic use of temporal cues (timing) in reversal learning: A comparative study in CD1 and C57BL/6 mice

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Behavioral flexibility is the ability of humans and non-human animals to adapt to environmental changes by modifying their responses. Outbred CD1 and inbred C57BL/6 mouse strains showed differences in their performance in novelty, spatial learning, and memory tasks. The Midsession Reversal Task (MSR) assesses cognitive flexibility by requiring subjects to adapt to changes in reinforcement contingencies during the middle of a session. However, the performance of mice in MSR is currently unknown. This study analyzes the behavioral flexibility of C57BL/6 and CD1 mice in tasks with fixed (midsession) and variable reversals at 100% or 50% reinforcement probabilities. A fixed reversal with 100% reinforcement (F100) was used in phase one. Phase two involved a variable change with 100% reinforcement (V100). Phase three used a variable reversal with 50% reinforcement. In half of the subjects, phases 1 and 2 were switched to analyze the impact of past outcomes on cognitive flexibility. Our data indicate that CD1 and C57BL/6 mice complete the MSR task and develop a distinct response pattern depending on the phase. Despite past outcomes, CD1 shows an increased proportion of correct responses in phases 1 and 2 compared to C57BL/6 mice. Both mouse strains had similar correct responses in phase 3, in which the predictor of reinforcement was weak (50%). The problem-solving strategy employed by mice in the MSR task and under variable conditions was identified as a combination of win-stay/lose-shift (WSLS) and timing.

Keywords: Behavioral flexibility, midsession reversal task, variable changes, C57BL/6, CD1