Basal and exploratory activity of mice: individual testing versus automated monitoring in a social home cage context

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Basal and exploratory activity of mice are traditionally assessed in test batteries in which animals are tested individually. This approach is labor intensive and inefficient given the large number of genetically modified mouse lines that need to be phenotyped. In addition it yields unreliable results due to the lack of standardization and the stress induced by social isolation of the animals, frequent handling, and exposure to changing testing environments. TraffiCage and the operant learning environment IntelliCage are newly developed fully automated and standardized testing devices that permit to investigate transponder tagged mice directly in their home cage and in a social context. In order to evaluate the suitability of TraffiCage and IntelliCage to assess basal and exploratory activity of mice, we have tested three mouse strains (C57BL6, DBA/2, B6129F1) and a mutant line underexpressing the subunit NR1 of the NMDA receptor first in TraffiCage and IntelliCage and then individually in an established test battery (open field, light/dark box, O-maze, emergence test, object exploration). In order to compare the reproducibility of results, a genetically heterogeneous population (C57BL/6 x 129Sv F2) was tested twice with an interval of 4 months in IntelliCage and in the open field test. Both TraffiCage and IntelliCage readily discriminated the three mouse strains as well as mutants and controls of the NR1 line based on measures of spontaneous activity. Group differences correlated well between TraffiCage and IntelliCage, but were only partial predictors of results obtained in subsequent individual tests, indicating that new protocols in the home cage environment of TraffiCage and IntelliCage need separate validation. Repeated analysis of the F2 population revealed much improved reproducibility of activity measurements obtained in IntelliCage compared to individual testing in the open field.