

The structure and heritability of cross-arena traits in cognitive and exploratory batteries for mice

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This report presents analyses of cross-task individual differences in two separate studies; firstly, analyses of cognitive tasks from the London laboratory, and secondly, a meta-analysis of exploratory tasks from the Zurich laboratory. In the first study, 84 male sibling pairs (total N=168) from a population of heterogeneous stock (HS) mice were run on seven different cognitive arenas: T-maze, Morris maze, water plus maze, Hebb-Williams maze, two puzzle boxes, and an object exploration task. Measures from these diverse arenas all loaded positively on the first factor in principal component factor analysis, nominating the presence of a general cognitive ability in mice. This g-factor accounted for approximately 24% of the variance, similar to our previous study of 84 HS mice. A robustness analysis showed this factor structure to be very stable to permutations of the battery and sibling correlations indicated a 'crude heritability' of 42% for the g-factor derived from the battery. In the second study, >4,200 mice of inbred, hybrid, mutant and outbred genotypes ran one or more of five exploration tasks. Of the 1,966 individuals that ran more than one procedure, 764 ran the open field, null maze and light-dark box, 1285 ran the emergence test and novel object test, and 367 ran all five tests. In this last group, individual consistency in exploratory movement type across all arenas was examined. Proportion of time engaged in scanning movement correlated positively amongst the arenas (first factor accounting for 32% of variance), similarly for resting (53%) and progressing (63%) measures. Other analyses to be also presented. Conclusions centre on the reliabilities of mouse behaviour and the use of factor analysis in a confirmatory context to clarify cross-arena traits and the measures that best inform on these traits.

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