Adult hippocampal neurogenesis and behavioral performance - cause or correlation?

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The nature of the relationship between adult hippocampal neurogenesis (AHN) and behaviour is heavily debated. One reason is that it is difficult to experimentally alter AHN without collateral changes that may be wholly or partly responsible for changes in behaviour. Another reason is that commonly used statistical methods cannot distinguish between a causal or correlational relationship.

We tested laboratory mice of two strains, C57BL/6 and DBA, characterized by high and low levels of AHN. Age is strongly correlated with AHN, thus, both strains were tested at the age of 9 and 17 weeks, this age difference predicts a decrease of 60% in AHN. Behavioural performance was assessed in the IntelliCage for motor impulsivity, anxiety and exploration. Markers for young neurons (DCX) and proliferating cells (Ki67) were used to determine the level of AHN. This set up allows to identify whether behavioural traits show a causal relationship on either a phylogenetic (strain) or ontogenetic scale (age) with AHN. Causal models in the form of a linear regression and a Bayesian analysis will be used to distinguish between neurogenesis dependent and independent effects on behaviour.

Behavioural results show strong strain effects, where DBA mice are more anxious and impulsive compared to the C57BL/6 mice. Age effects were less pronounced, although younger mice did show more exploratory behaviour compared to older mice. Measurements to determine AHN levels are ongoing.

By using causal modelling we will try to resolve some of the confusion surrounding the relation between adult hippocampal neurogenesis and behaviour.

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