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The causes and consequences of stereotypic behaviour in the striped mouse, rhabdomys

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ABSTRACT

Environmentally-induced stereotypic behaviour (SB) results from the chronic impact of captivity on brain development and function and, consequently, on behaviour. My study sought to determine group- and individual-level predictors and correlates of SB in the striped mouse, *Rhabdomys dilectus*, and to identify the mechanisms underlying the stereotypic phenotype. This aim was addressed by collecting cross-sectional and longitudinal behavioural and physiological data from a combination of wild-caught (WC) and captive-born (CB) striped mice born and reared in different social and environmental conditions. First, I examined the group-level effects of rearing conditions. Results confirmed the genetic contribution to SB performance in striped mice, and furthermore indicated that (1) striped mice weaned at or later than their natural weaning age are less likely to develop SB than striped mice weaned prematurely; (2) striped mice reared biparentally showed significantly less SB as adults than striped mice reared by their mothers alone; (3) striped mice raised from weaning in enriched conditions were four times less likely than standard-housed individuals to develop SB, an effect which endured after enriched-housed striped mice were transferred to standard housing; and (4) birth origin predicts the emergence of SB in striped mice, with those WC individuals trapped as adults being relatively protected from the development of SB compared with both WC individuals trapped as juveniles and CB striped mice. I also showed that (1) WC striped mice were more fearful and less active than CB animals, but that these traits did not covary with SB, and (2) WC striped mice were less perseverative and behaviourally more flexible than CB animals, traits that did covary with SB. Second, I characterized the developmental trajectory of SB in a large group of CB, standard-housed striped mice, and then investigated potential individual-level predictors, mediators, and correlates of SB in these animals. Measures of perseveration, activity, and anxiety/fearfulness assessed in juveniles before the development of SB did not predict which animals later developed SB, but stereotypic adults were more active and more perseverative than non-stereotypic individuals. Whilst preweaning developmental maturity did not predict which striped mice later developed SB, striped mice showing accelerated development in the preweaning period were likely to show SB at an earlier age, at a higher frequency, and potentially with reduced variability, effects which persisted into adulthood. In conclusion, my study shows that more naturalistic rearing environments reduce the incidence of SB, an effect mediated by genetic factors and possibly also by experience-dependent alterations in

forebrain function. However, further work is necessary to explore whether the association between forebrain function and SB expression in striped mice is causal because, whilst environments which decrease perseverative tendencies also reduce SB, I found no evidence that such tendencies predict which striped mice later develop SB.