Links between activity, exploratory behavior, and energy metabolism: lessons from planned and unplanned artificial selection experiments

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Through domestication, humans have unwittingly initiated "unplanned" long-term artificial experiments that, today, can be useful to understand evolutionary processes. For example, the domestic dog has undergone extensive artificial selection resulting in an extreme diversity in various traits among breeds. Another "unplanned" selection experiment was conducted in the last century when multiple strains of inbred mice were created by brother-sister mating. Because these domestication experiments have been widely replicated (>100 breeds or strains) and carefully maintained, they provide opportunities to test for the presence of (broad-sense) genetic correlations. Data assembled from the dog literature indicate that active, obedient, and aggressive breeds have, respectively, lower body mass, lower mortality rates, and higher energy expenditure. Data on wheel-running and open-field behavior in various strains of inbred mice show that both traits are highly and positively correlated. These results are more or less similar to those obtained in a highly controlled artificial selection experiment on wheel-running in mice, where high-runner mice have higher energy expenditure than control mice, but do not differ in terms of open-field behavior. We re-evaluated whether open-field behavior differ between selected and control mice using a different open-field protocol and discuss similarities and differences between domestication and artificial selection experiments.