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**Lumping, splitting and evolving: Strategies to characterize behavioral phenotypes associated with substance use**

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Several behavioral phenotypes, for example, sensation seeking, have been identified as reliably associated with heightened substance use and the development of substance use disorders. Some of these phenotypes are heritable, and animal models have been developed to facilitate our understanding of their mechanistic relationships to substance use, including their epigenetic and genomic relationships. Delay discounting (relative preference for smaller, immediate rewards over larger, later rewards), is one of these behavioral phenotypes. Through a larger project identifying differentiating genes and RNA transcriptome networks associated with more delay discounting, we have characterized this phenotype in 300 genetically-heterogeneous adult rats (150 males and 150 females) by assessing choice between a small, immediate sucrose solution reward and 150 ul delivered following a delay. Historically, analyses of the delay discounting phenotype have focused on preference ratios and, occasionally, on reaction times. Our approach has been to characterize additional aspects of performance, including activities during forced choice trials, as well as extraneous responding and the temporal patterns in free choice trials. We have also examined behavior during task learning and during continued task exposure. These measures have permitted us to identify indices correlated with preference (lumping), indices that provide unique information (splitting), as well as identify individual differences in the evolution of preference ratios in delay discounting. While future analyses will suggest if these behavioral nuances may be differentially linked to substance use and genetics, our research provides a case study for others on the opportunities and threats associated with these phenotyping strategies.