The Effects of Environmental Enrichment on Post-Trauma Anxiety and Alcohol Use Disorder

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Background

- People that develop post-traumatic stress disorder (PTSD) are 3-5 times more likely to develop a substance use disorder
- Alcohol is the most commonly abused substance among individuals with PTSD
- The interaction between trauma and environment and its influence on the development of alcohol use disorder is not well understood.
- Weanling mice (d22) were exposed to a synthetic fox pheromone (TMT) and assessed for differences in adolescent anxiety and adult alcohol consumption (**Fig.1**). Mice were reared in two different environments: standard (SE) or enriched (EE) (**Fig.2**).
- Findings demonstrate the importance of environment as a developmental modifier for post-trauma anxiety and alcohol use disorders

Methods

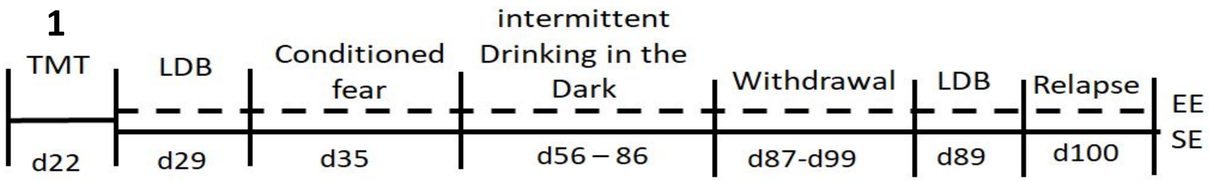

Fig.1 A timeline of general methods.

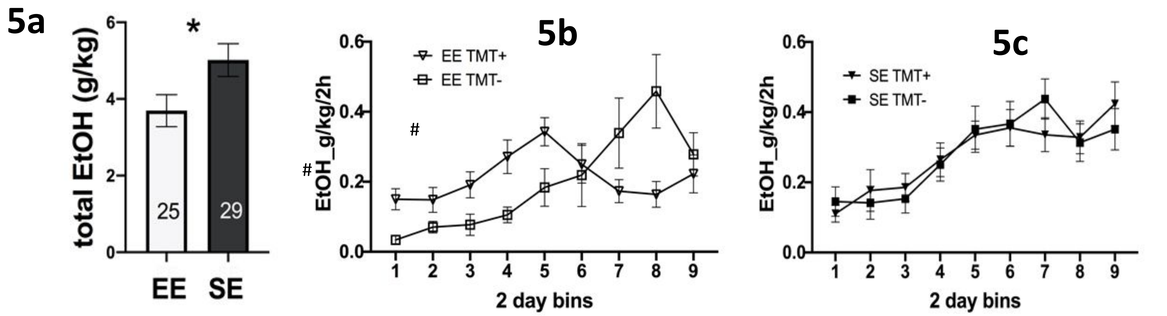

Fig. 5 The amount of ethanol (10%) consumed adjusted for body weight. a) The total amount of EtOH consumed across all sessions was less for EE vs SE mice. Shown across 2 day averages, b) mice reared in SE after TMT-exposure did not differ in EtOH consumption; however, c) mice reared in EE after TMT-exposure initially consumed more EtOH compared to control mice. * indicates p < 0.05 for EE vs SE, # indicates p < 0.05 for TMT+ vs TMT-

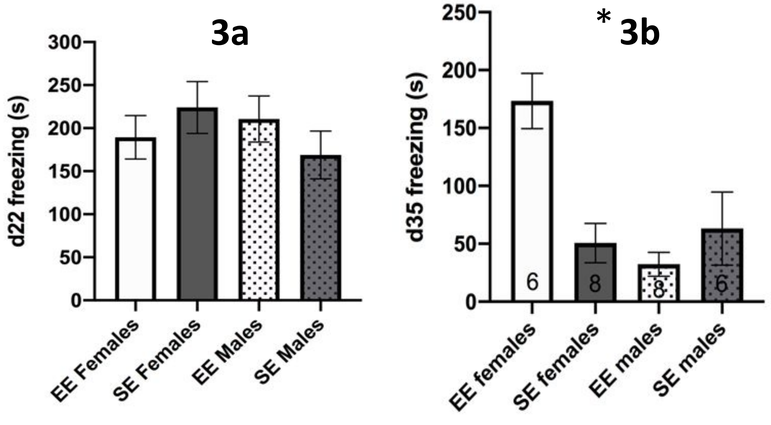

Fig. 3 TMT+ mice were assessed for a) a priori group differences in freezing due to housing and sex and b) freezing during reexposure to the conditioning environment. * indicates p < 0.05 for EE females vs SE females, EE males, and SE males

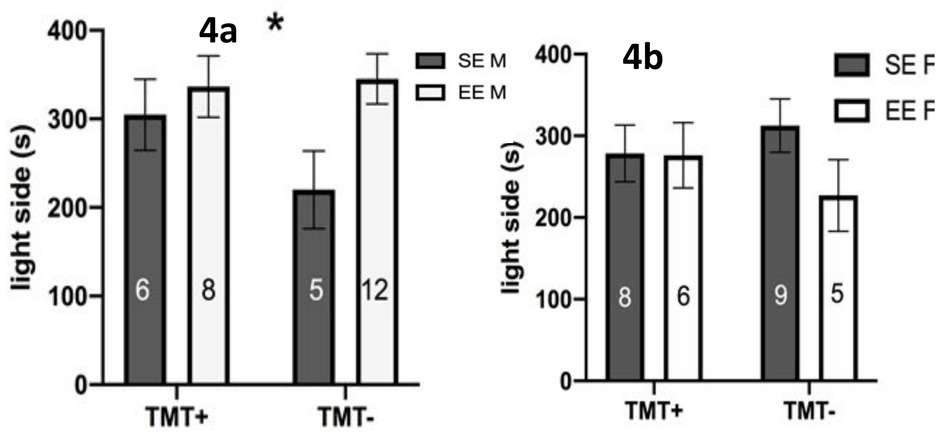

Fig. 4 shows the time spent on the light side of a light-dark box for a) males (F(1,27) = 4.7, p = 0.039) and b) females. * is p<0.05 SE vs EE

Results & Conclusions

- We found that TMT is an effective stressor indicated by freezing behavior during d22 conditioning ($t(44) = 8.8$, $p<0.0001$; data not shown).
- TMT-exposed mice had no a priori group differences due to housing or sex (**Fig. 3a**), EE females showed heightened freezing when re exposed to the conditioning environment (**Fig. 3b**).
- Data from the Light Dark Box shows an effect of housing after only one week in the EE housing for males (**Fig. 4a**), but not females (**Fig. 4b**).
- The total amount of alcohol (g/kg) consumed overall was lower in EE vs SE mice (**Fig. 5a**), but did not differ due to TMT treatment or sex.
- EE mice exposed to TMT initially drank more than TMT-naive EE mice, although levels later converged (**Fig. 5b**). Drinking in SE mice was unaffected by TMT exposure (**Fig. 5c**).
- Future studies will assess neuronal activation in key brain regions as well as assess hippocampal-dependent learning and memory, and neuronal activation in the hippocampus for sex and housing effects.

Fig. 2 represents a standard (left) versus an enriched (right) environment