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The Effects of Adolescent Housing Condition and Voluntary Exercise on Alcohol Intake and Stress Response in Male Long-Evans Rats

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Introduction
- Exposure to chronic stress during adolescence has been shown to lead to behavioral and cognitive deficits in rats (Green et al., 2013).
- A correlation has been found between exposure to chronic stress during adolescence and increased alcohol intake in rats (Besheer et al., 2013).
- Regular voluntary exercise can be a means to relieve stress and reduce anxiety-like behavior in rats (Fulk et al., 2004).
- By giving chronically stressed rats the opportunity for regular voluntary exercise during adolescence, their anxiety-like behavior and alcohol intake may be lessened due to the protective effects of exercise.
- Original study was run in 2016 and replicated in 2017

Methods
Subjects:
32 Male Long-Evans rats arrived postnatal day (PND) 21

Adolescent Chronic Stress Paradigm:
- Socially Isolated (SI) Housing: 1 rat per cage (n=16)
- Group Housed (GH): 4 rats per cage (n=16)
- All rats were GH from PND 21-27 and put into GH/SI on PND 28
- After 6 weeks (at PND 69) all rats became SI to prepare for subsequent procedures

Voluntary Exercise Protocol:
- PND 28-69
- 8 SI and 8 GH rats were designated as runners
- SI and GH runners were given 30 minutes of exposure to a running wheel (Figure 1b) five days per week for five weeks
- SI and GH non-runners received no handling or stimulation during this time except during cage changes
- Distance (km) was measured using BoGeer YT-813 bicycle odometers (Figure 1a)

Anxiety-Like Behavior Measure: Elevated Plus Maze
- Time spent in open arms, closed arm entries. Measured 5 min. per rat
- Open arm time is a measure of anxiety-like behavior
- Closed arm frequency is a measure of general locomotor activity

Swim Stressor Procedure and Corticosterone (CORT) Measurements:
- Each rat swam for 5 min. in a bucket (9.5"x15") filled with 9" of water at 25° C
- Blood samples via tail nick were taken at 60 min. pre-stressor and 5 and 30 min. post-stressor
- CORT measured using a 96 well plate competitive enzyme immunoassay containing a polyclonal CORT antibody (Immunodiagnostic Systems)

Results and Conclusions
- Voluntary Exercise: GH rats ran greater total distances than SI rats (Figure 1c), although running behavior dropped off after two weeks of exposure (Figure 1d).
- Elevated Plus Maze: T-tests revealed that SI runners (t(13)=2.882, p<0.01) and GH non-runners (t(13)=2.701, p<0.01) spent significantly more time on the open arms compared to SI non-runners.
- CORT: All rats showed an intact stress response, with 5 and 30 minute post-stressor CORT levels significantly higher than pre-stressor levels (Figure 3).
- EIOH: Average weekly 30min. ethanol preference stabilized at around 50% (Figure 4c) whereas average weekly 24hr. ethanol preference decreased steadily over time for all groups of rats (Figure 4d).
- This data suggests that voluntary exercise may have an effect on reducing anxiety-like behavior in SI rats.

Future Directions
- The data from these studies are included and described in detail in Caroline Lynch’s Honors Thesis

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