

The effect of environmental enrichment on the cerebral folate deficiency model of ASD

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Environmental Enrichment

- Environmental enrichment has shown capable of ameliorating ASD symptoms.
- Is commonly used to reduce stress-related anxiety in animals (rats, mice, monkeys, etc.).
- Gives animal opportunity to interact with sensory, motor, and social stimuli in comparison to standard lab conditions.



Significance

If an enriched environment has a positive effects on symptoms and increase neuronal activity in the brain regions associated with ASD, this enrichment could signify a potential treatment for CFD-related ASD.

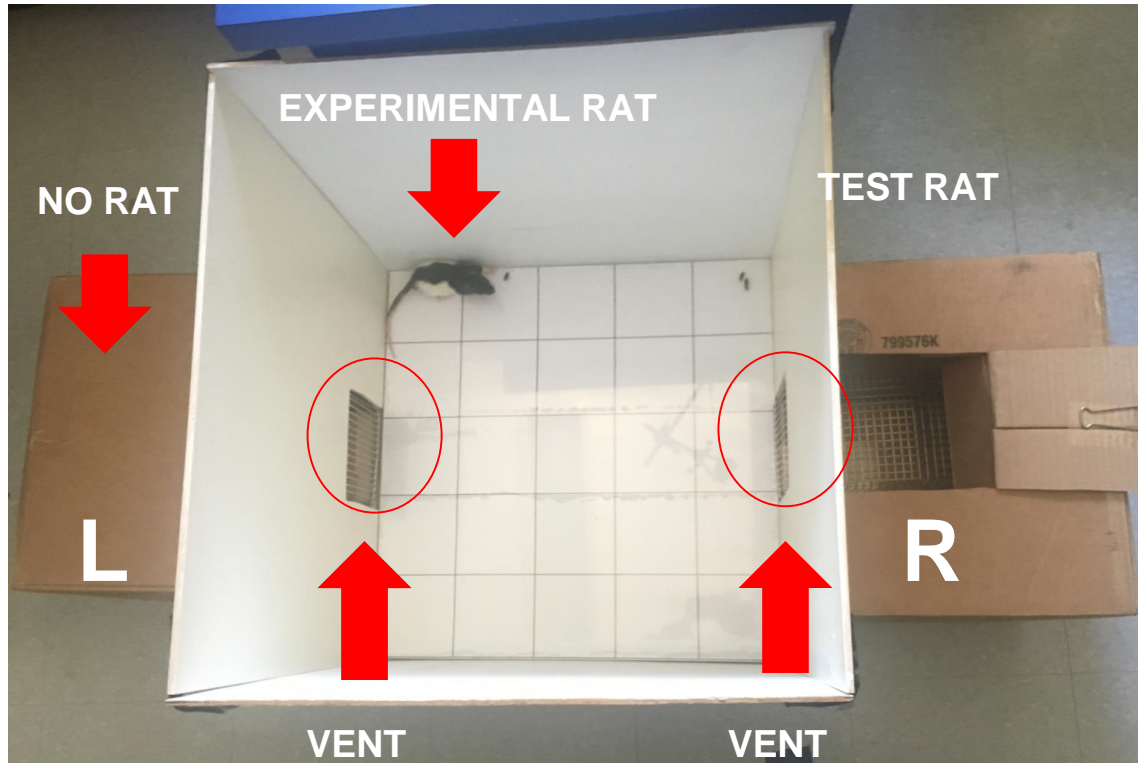


Question: How does exposure to an enriched environment improve a cerebral folate deficient model's social behavior and neural activity?



Hypothesis: Enriching both the CFD and neurotypical rats' environment will increase their social behavior. Markers of neuronal activity will also increase after exposure to an enriched environment.

Social Behavior Apparatus



Record:

- Bit on the vent
- Sniff the vent
- Looked at the vent
- Touch noses with the neurotypical rat in the right cage
- Duration and Amount

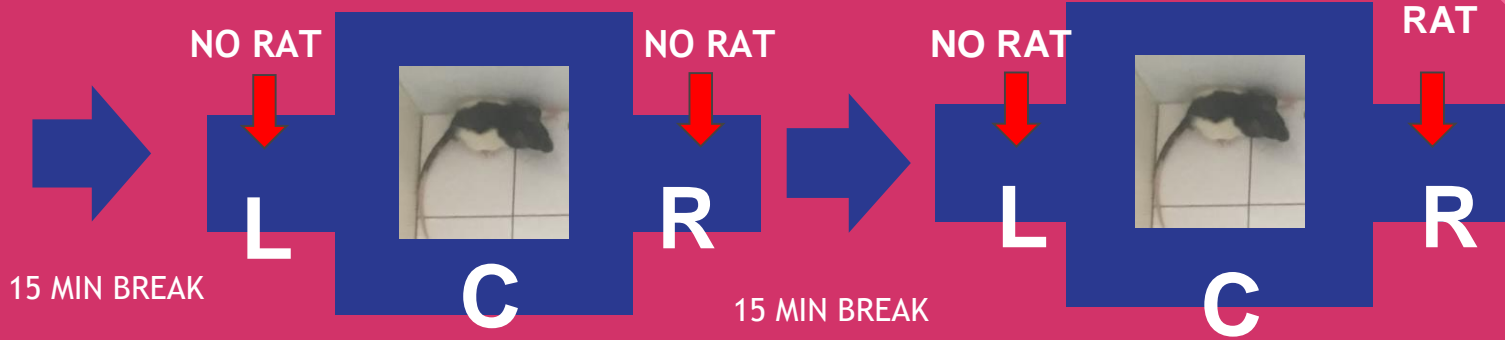
Social Behavior Test



Social Behavior Test



Step 1: Handling the rats (5 mins)

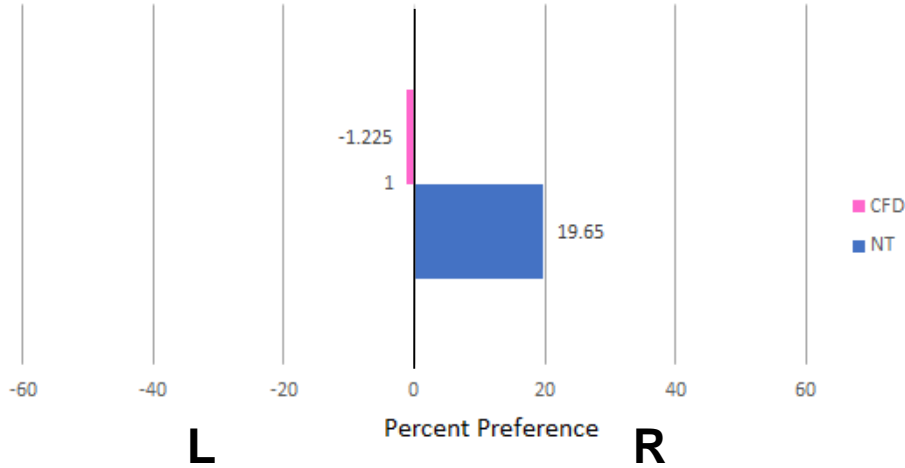


Step 2: Habitation

Step 3: Behavior test with rat inside the other box

NT rats have a stronger preference for social interaction than CFD rats

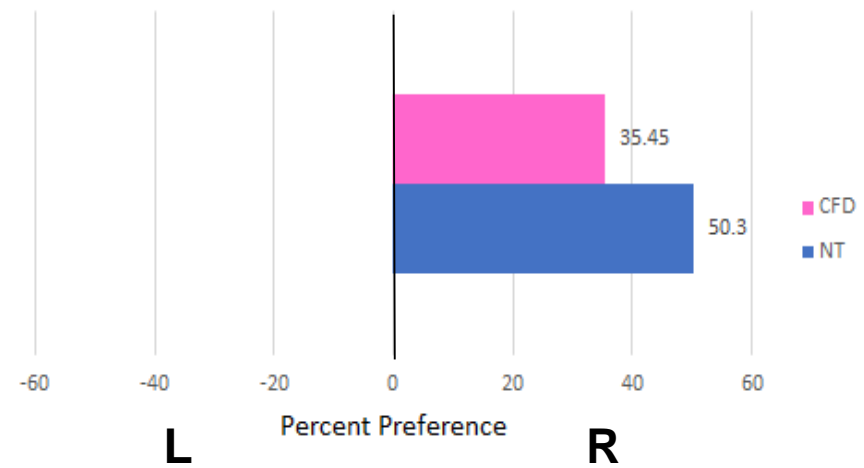
NT v. CFD Approaches



Non-social
(Left side of arena)

Social
(Right side of arena)

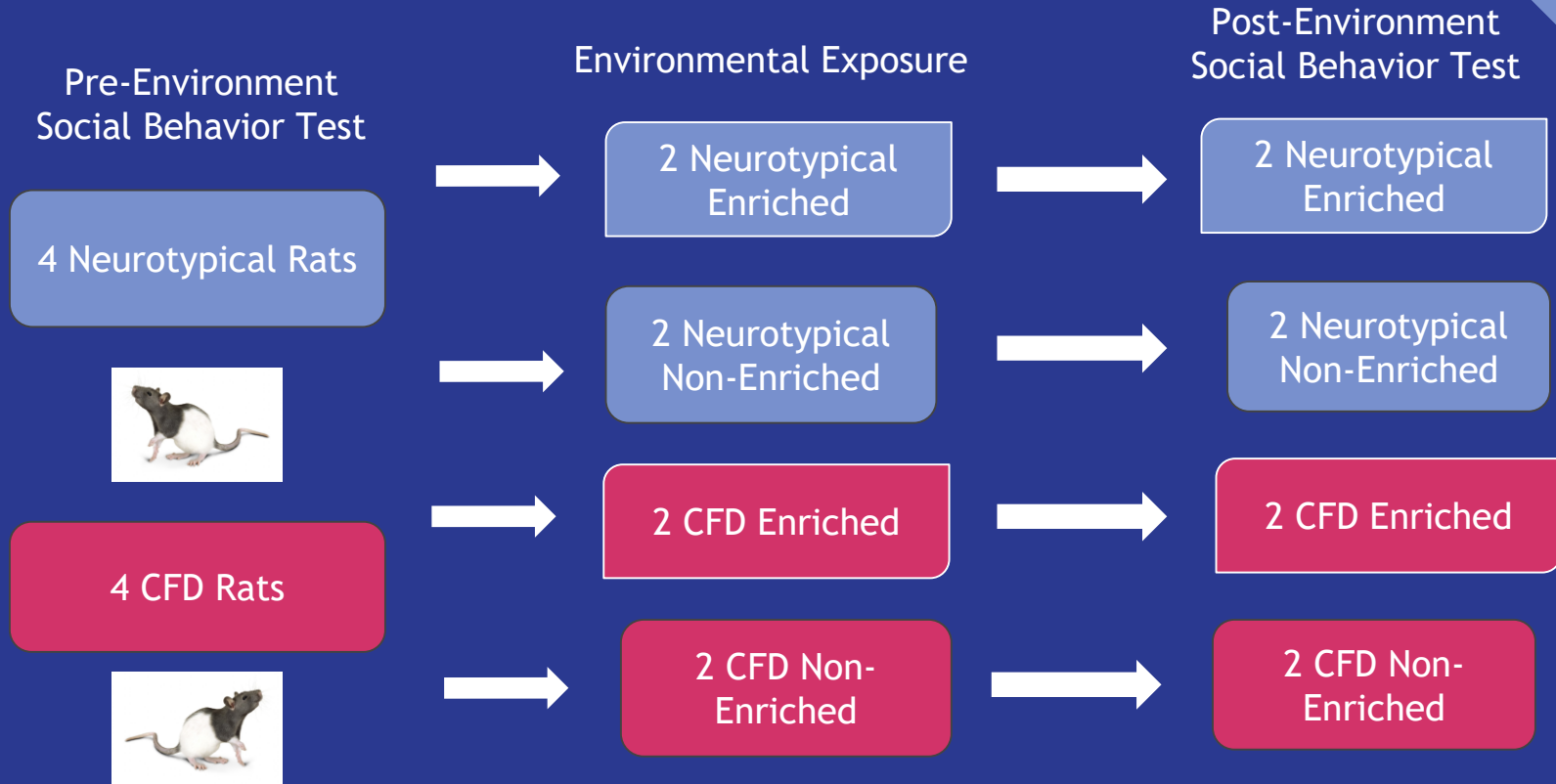
NT V. CFD Total Times



Non-Social
(Left side of arena)

Social
(Right side of arena)

Social Behavior Test Timeline



Non- Enriched Environment

Standard

2 NT & 2 CFD

- 1 water dispenser
- 1 food container
- Bedding
- 1 wooden block



V. Enriched Environment

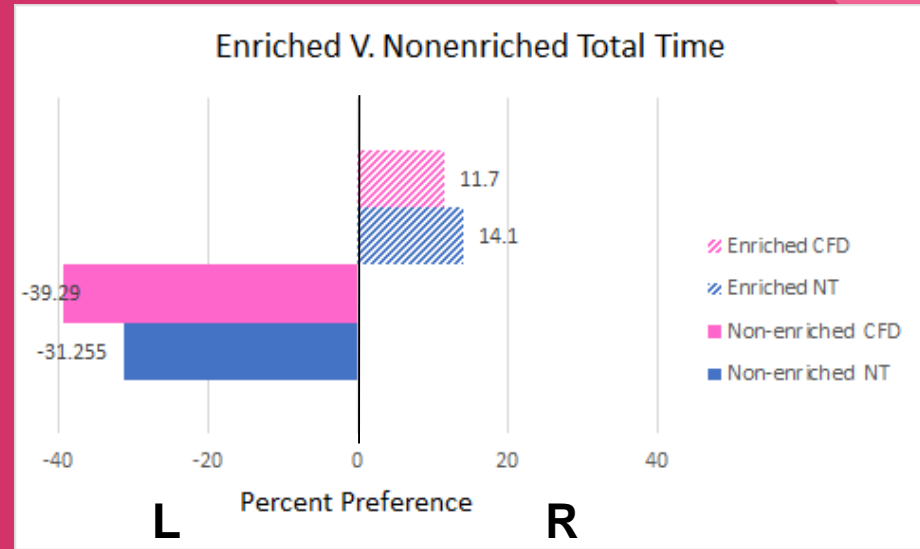
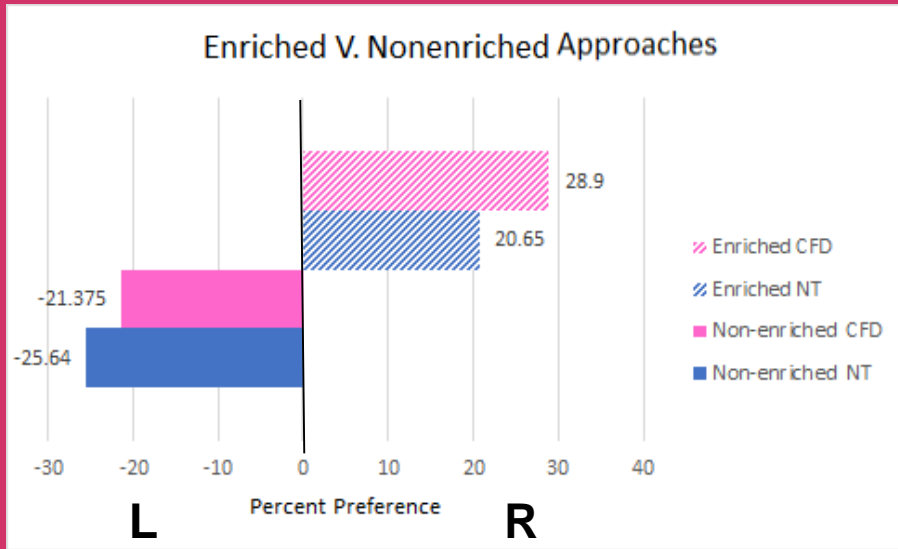
Enriched

2 NT & 2 CFD

- 1 water dispenser
- 1 food container
- Bedding
- 1 wooden block
- 5 additional toys



NT and CFD rats' social interaction improved after enrichment



Non- Social
(Left side of
arena)

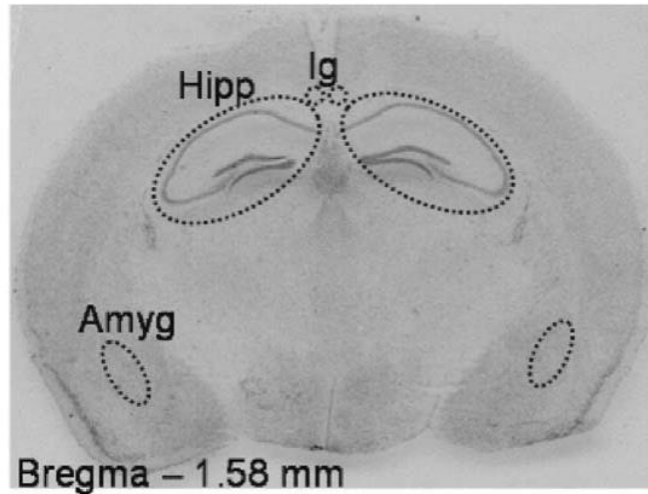
Social
(Right side of
arena)

Non-Social
(Left side of
arena)

Social
(Right side of
arena)

Brain regions related to ASD

→ Hippocampus: Memory and Learning → Supports social behavior



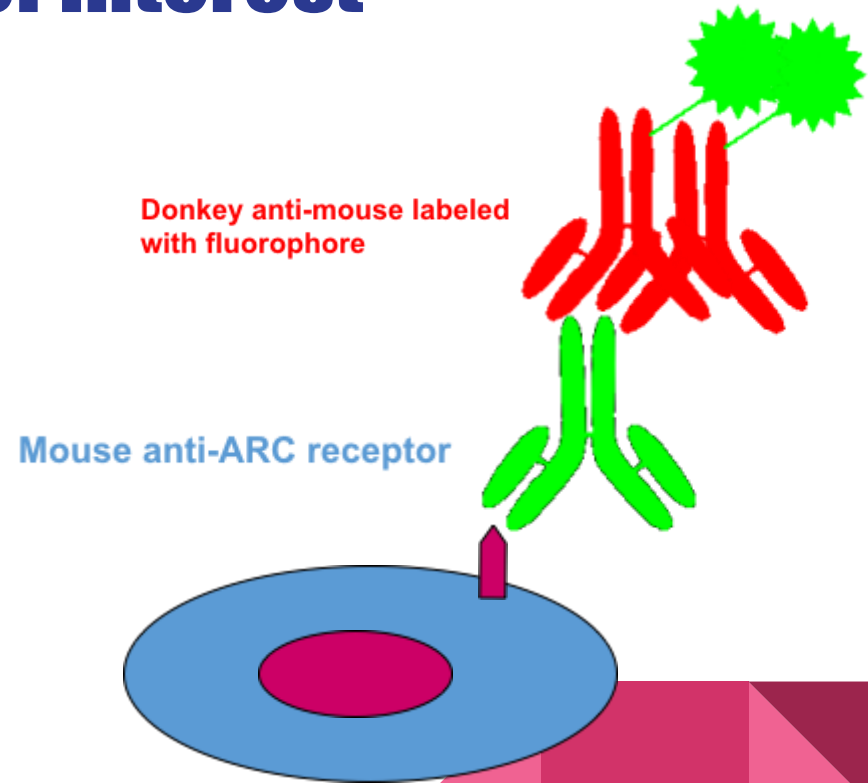
Proteins of interest

★ Folate receptors

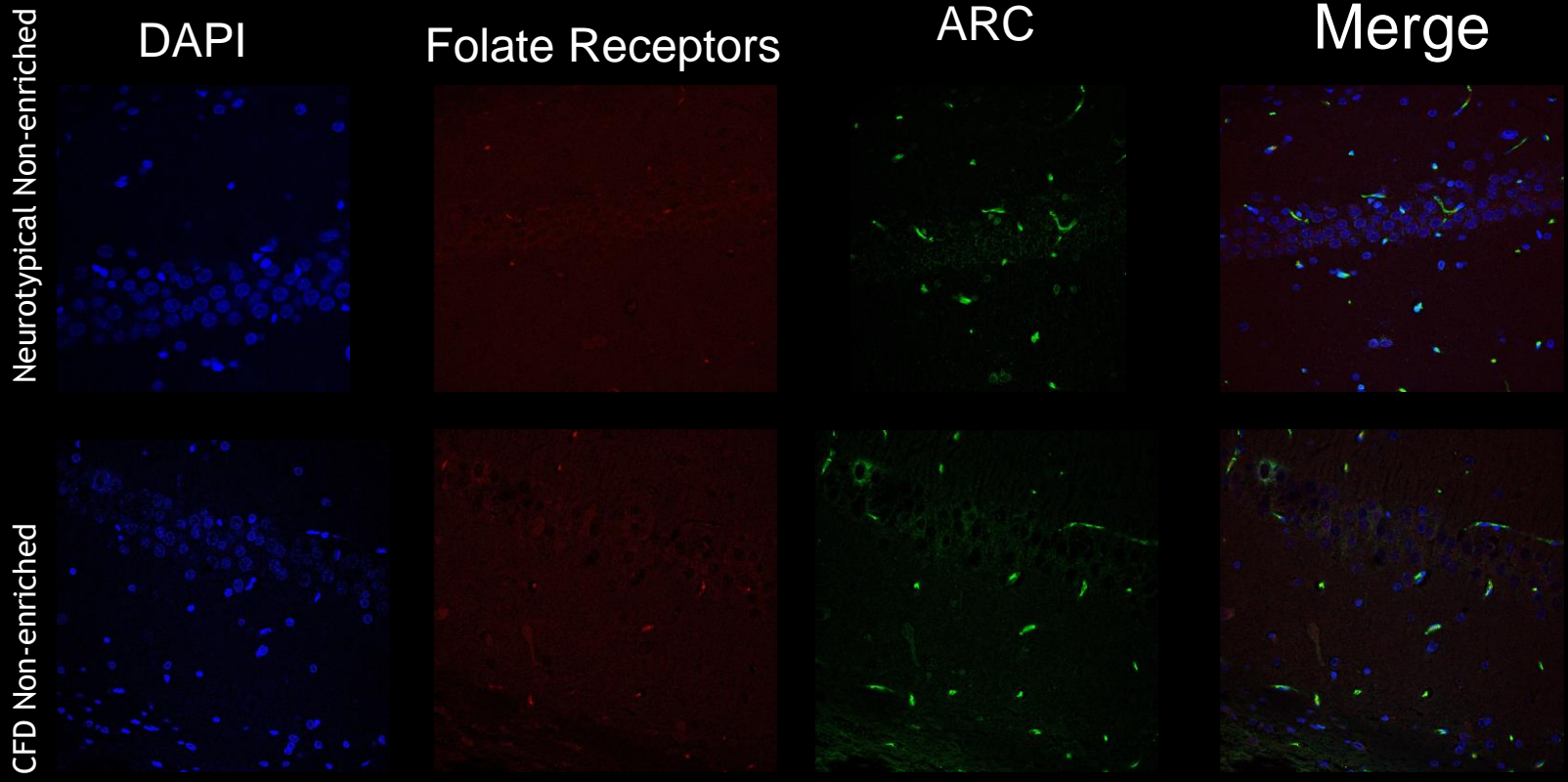
- During prenatal development, receptors were potentially blocked by anti-folate antibodies CFD rats.
- Bind folate
- Evaluate their presence and location.

★ Activity-Regulated Cytoskeleton (Arc)

- Indicator of neuronal activity
- Found in the neuronal dendrites and cell body
- Dysregulation of arc in ASD



IHC: Hippocampus



Summary

- CFD rats are less prone to social interaction than neurotypical both in approaches and total time spent.
- After being given the social behavior test for a second time, both neurotypical and CFD rats in the enriched environment showed increased sociability compared to both groups of the non-enriched.
- It appears that enriched environments have beneficial effects on sociability and may be a treatment for CFD- related ASD.



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Works Cited

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