Social isolation induced behavioral and immune changes

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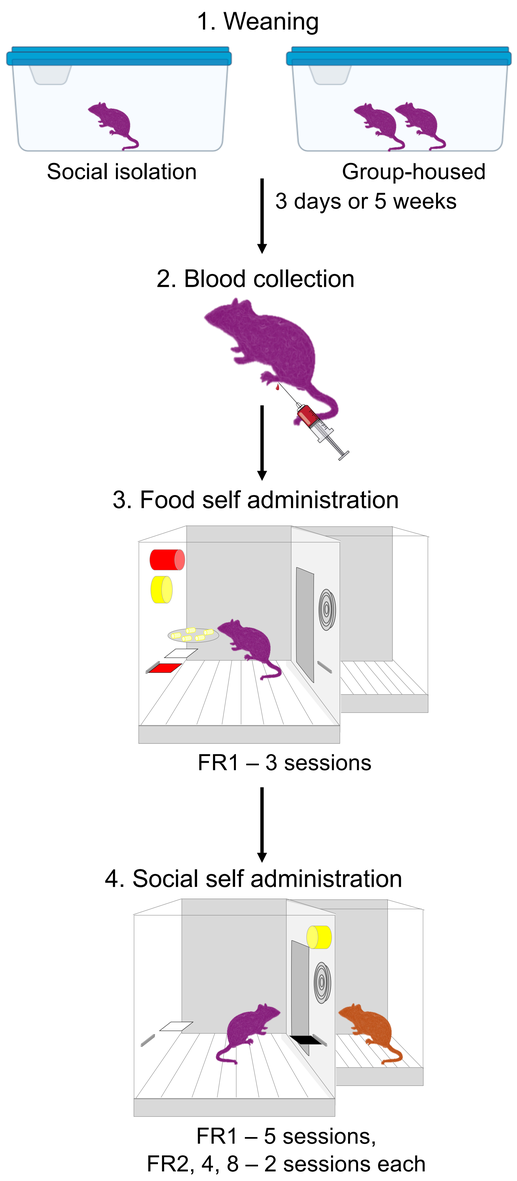
Background

- Social isolation is a significant risk factor for developing and exacerbating neuropsychiatric disorders, including addiction.
- The immune system has been implicated in orchestrating behavior.
- Human studies show correlations between neuropsychiatric disorders and dysregulated balance in pro- and anti-inflammatory cytokines.

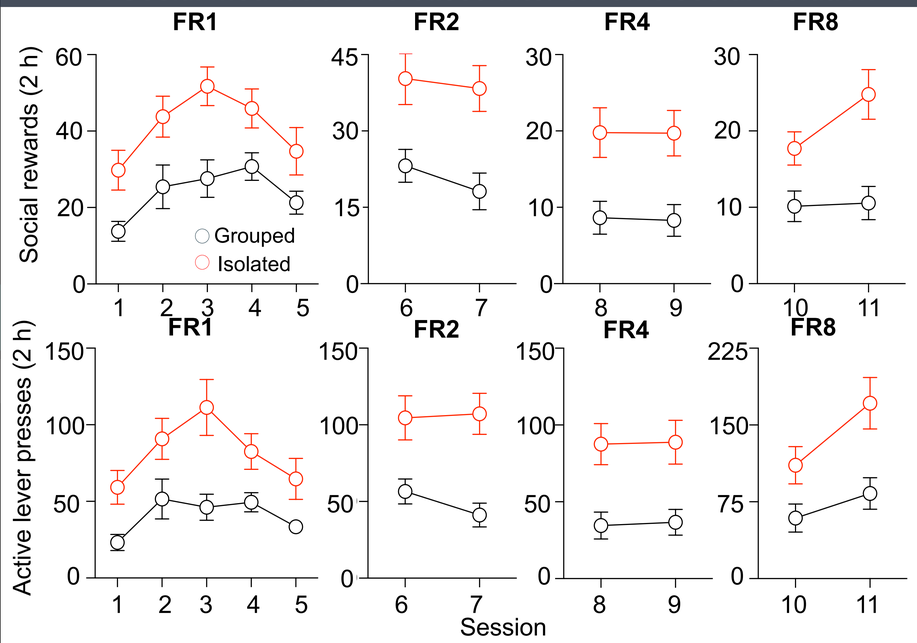
How does social isolation affect behavior and gene expression?

Methods



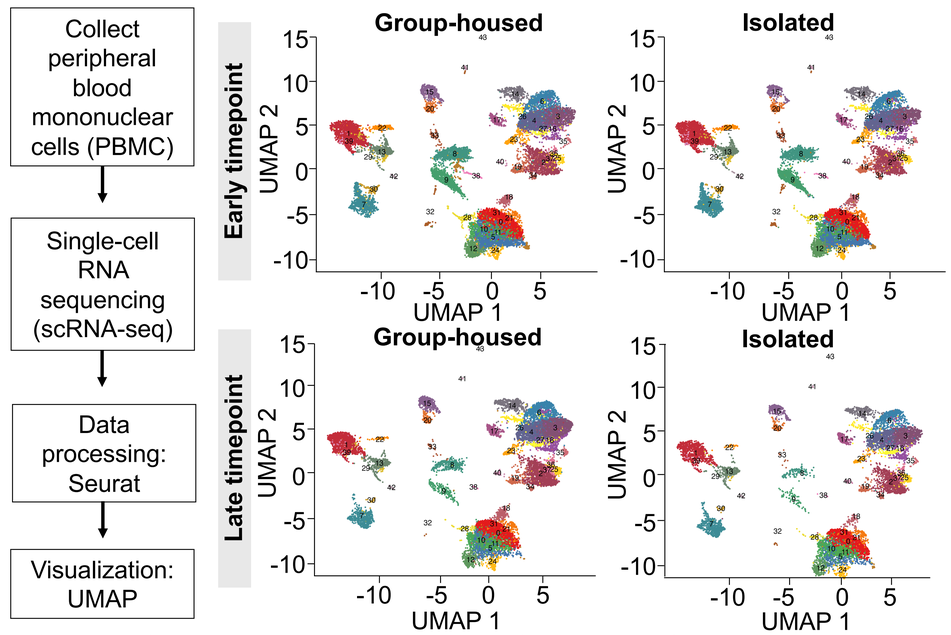
Results

1. Social motivation increases after chronic social isolation



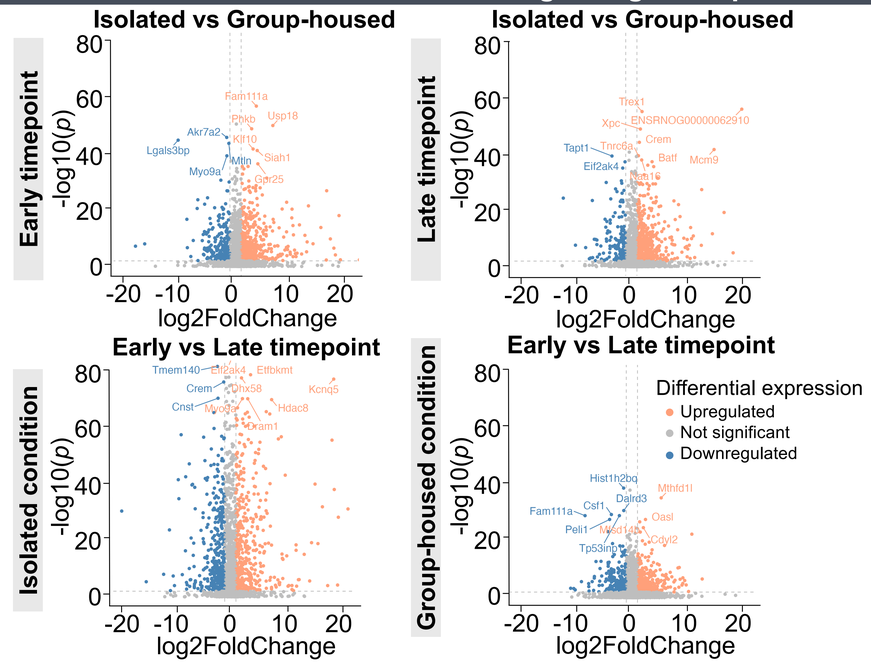
Rats were trained to self administer social interaction to gain access to a social peer. Isolated rats pressed the active lever and gained more rewards than group-housed rats.

2. UMAP of 44 clusters based on gene expression from rat PBMC



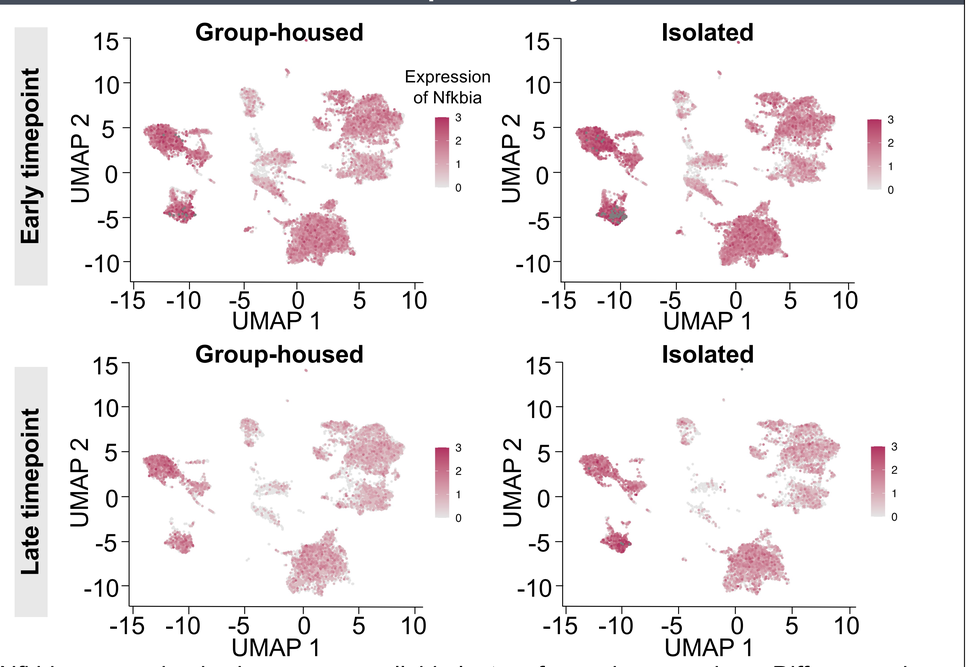
Uniform Manifold Approximation and Projection (UMAP) identified 44 clusters based on gene expression in rat PBMC representing transcriptionally similar cell populations.

3. Individual clusters of PBMC show changes in gene expression



Differentially expressed genes (DEG) were identified based on $|\log_2 FC| > 1$ and $p < 0.01$. Many of the DEGs are involved in immune signaling pathways and inflammation.

4. Differential Nfkbia expression by condition and time



Nfkbia expression is shown across all 44 clusters for each comparison. Differences in expression highlight condition- and timepoint-dependent regulation of NF-κB signaling..

Conclusions & future directions

- Acute (3 days) and chronic (5 weeks) social isolation induce molecular changes in inflammatory related genes such as Nfkbia, a negative regulator of NF-kB pathway.
- Chronic social isolation increases the motivation to seek social interaction, even when effort (FR) is increased.
- Future directions: assess molecular changes after social self-administration, manipulate inflammatory genes to reduce behavioral changes induced by social isolation.