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Cell type selective alterations to medium spiny neuron dendritic complexity in the striatum following high fat exposure

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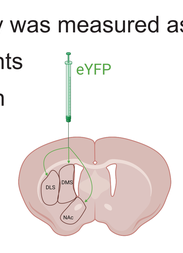
Background

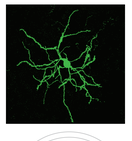
- Diet composition and overall weight impact reward related behavior.
- Mechanisms and neuronal subtypes mediating these alterations have yet to be discovered.
- The striatum, including the Nucleus Accumbens (NAc), dorsomedial striatum (DMS), and dorsolateral striatum (DLS), is of particular interest due to its roles in associative learning with rewards, motor function, and habit formation.
- Dopaminergic and glutamatergic signaling changes have been observed following a high fat diet (HFD) in the DMS and DLS.

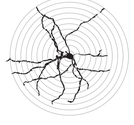
Here we examine multiple measures of D1 and D2 medium spiny neuron (MSN) dendritic complexity in male and female mice that consumed HFD across time.

Methods

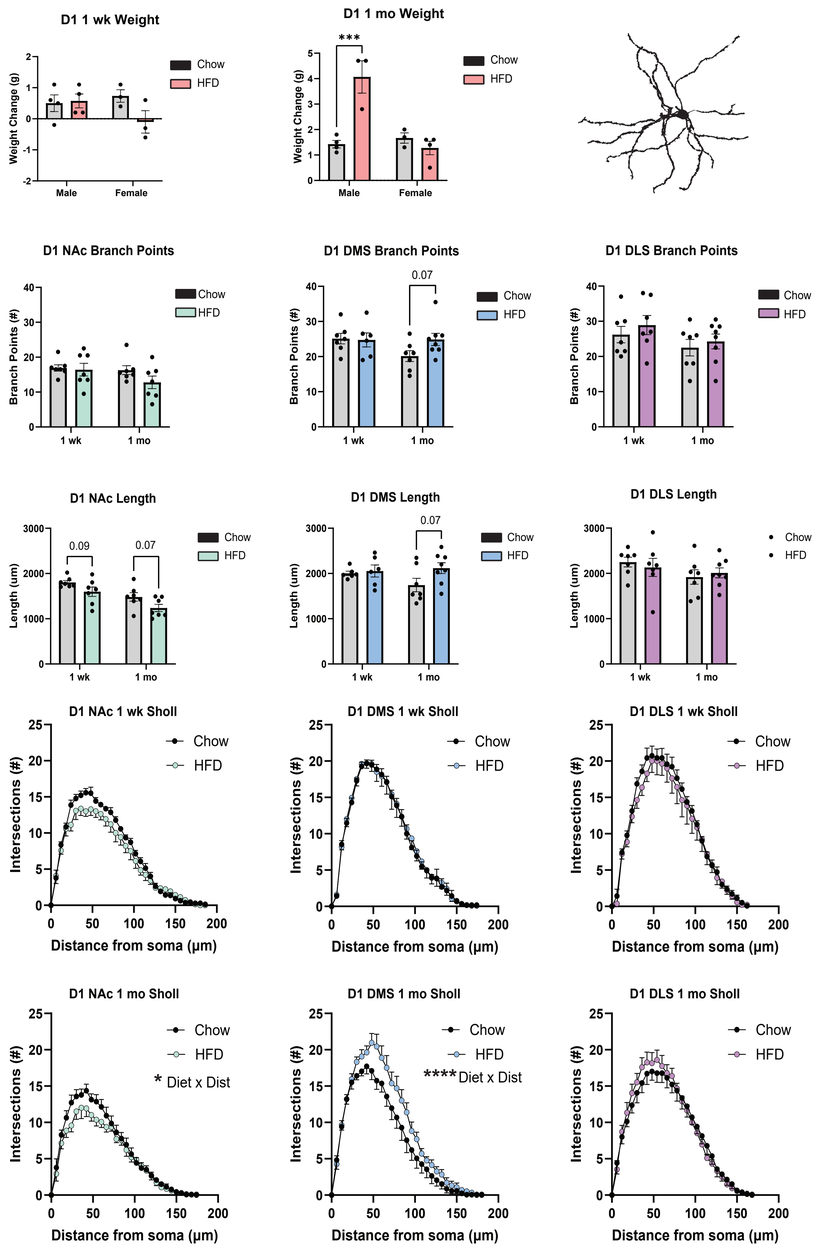
- Male and female D1-Cre or A2A-Cre mice underwent stereotaxic surgery with a dilute DIO-eYFP virus for sparse MSN labeling.
- Mice were group housed and exposed to HFD (45% calories fat) or standard lab chow (12% fat) for 1 week or 1 month.
- Body weight was measured before diet exposure and before perfusion.
- Perfused brains were cut into 100um thick slices and endogenous eYFP signal was enhanced by immunohistochemistry.
- Z-stacks of D1 and D2 medium spiny neurons in the NAc, DMS, and DLS were imaged at 40x on a Leica SP8 confocal microscope
- Confocal images were processed using Imaris software. Neuron soma and dendrites were reconstructed using the filament tool to extract morphological data.
- Dendrtic morphology was measured as:
  - Dendritic Branch Points
  - Total Dendritic Length
  - Sholl Analysis



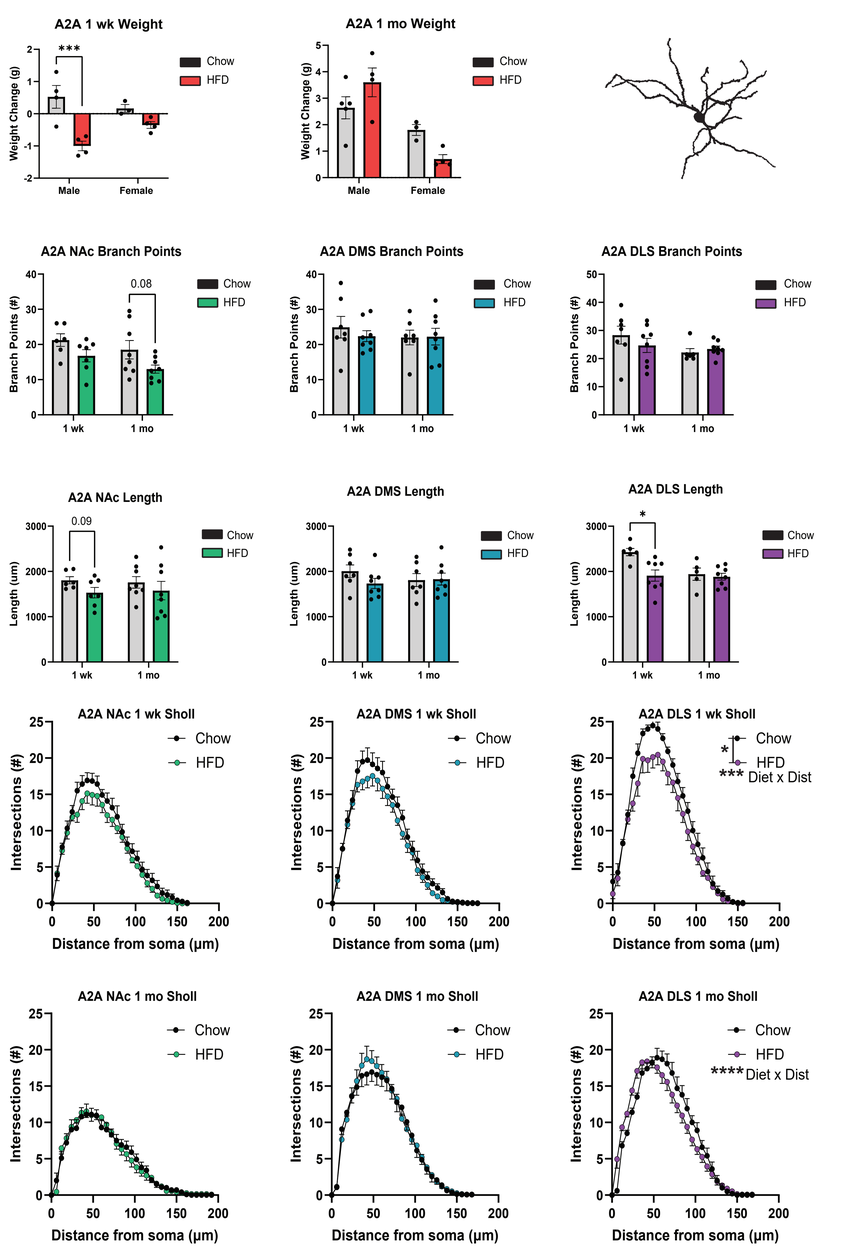




D1 MSNs



D2 MSNs



Conclusions and Futrure Directions

- Brain Region and cell type influence MSN plasticity in response to HFD.
- Morphological changes can occur independent of significant weight gain.
- HFD decreases complexity of NAc D1 neurons and DLS A2A neurons, but inreases complexity of DMS D1 MSNs.
- Further analysis will examine sex differences in these morphological effects in striatal MSNs.

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