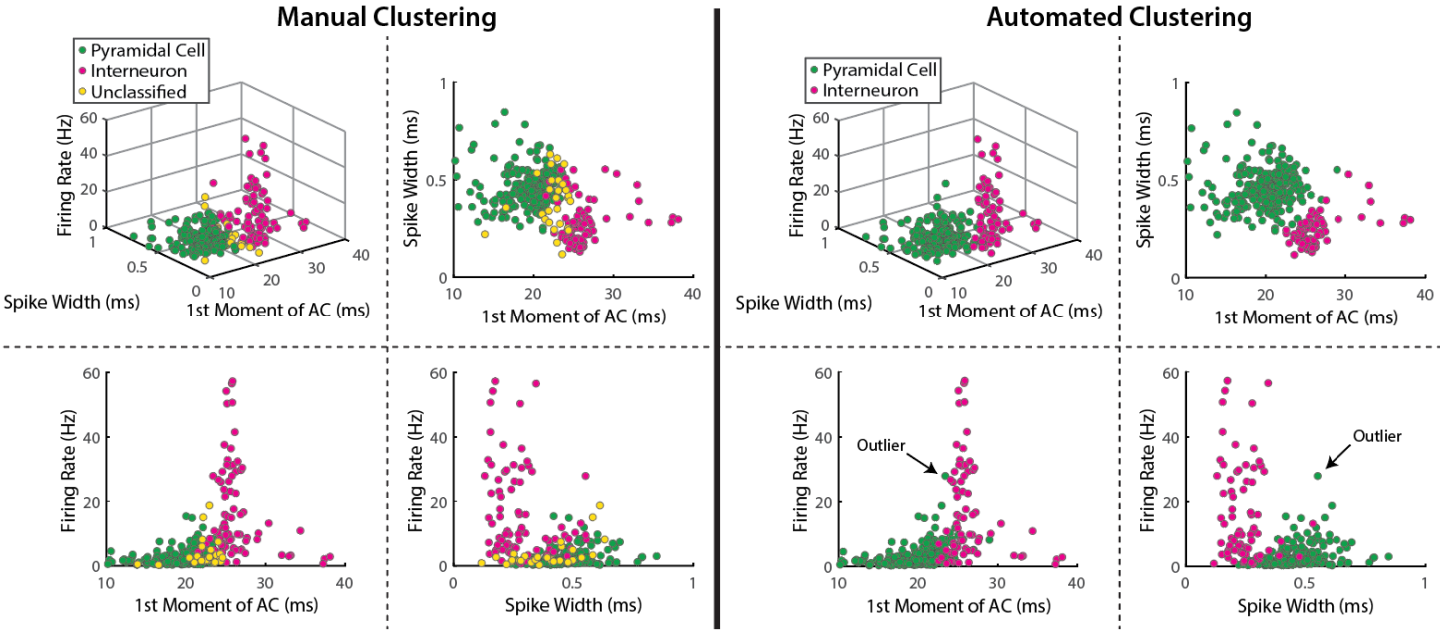
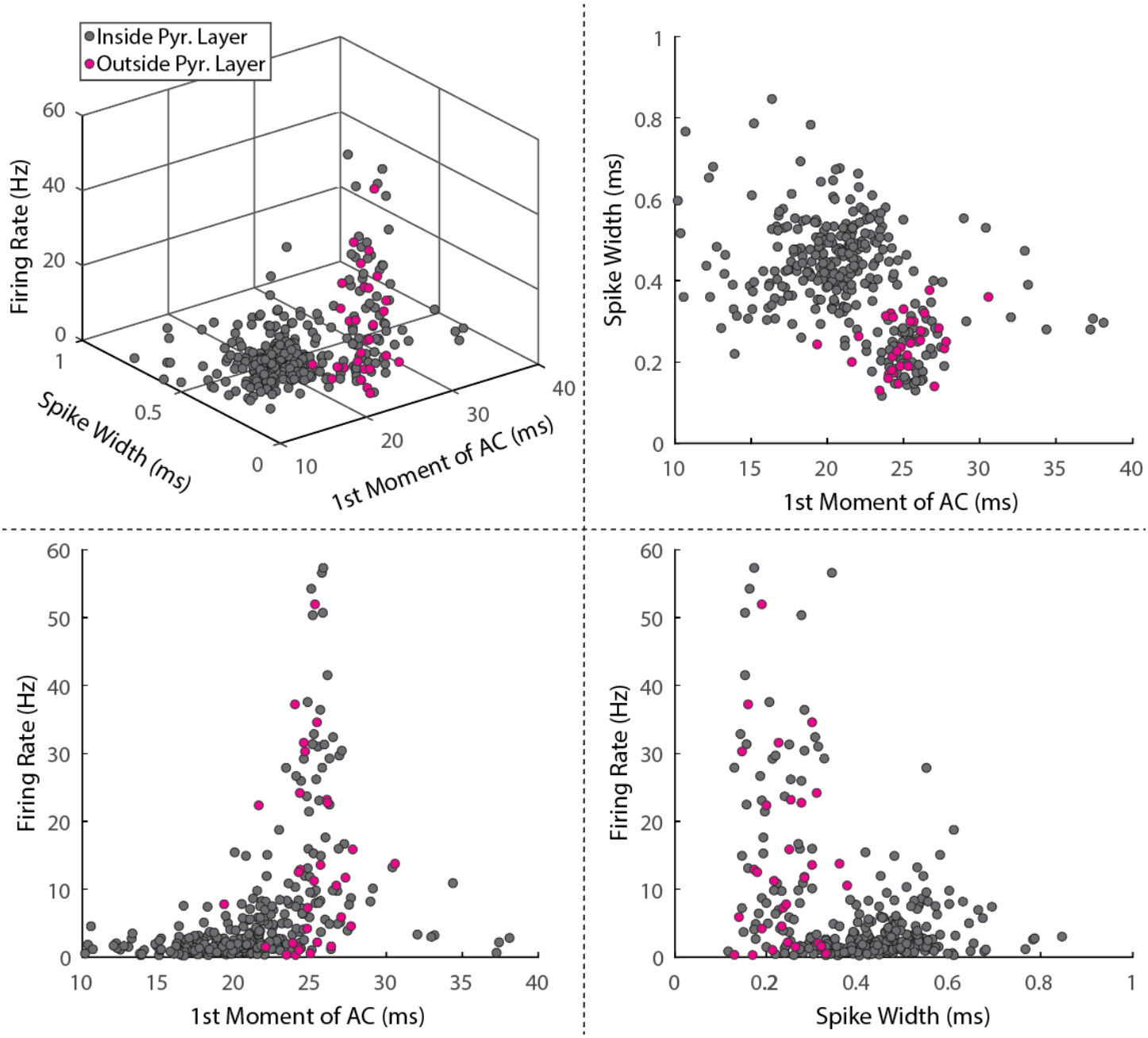


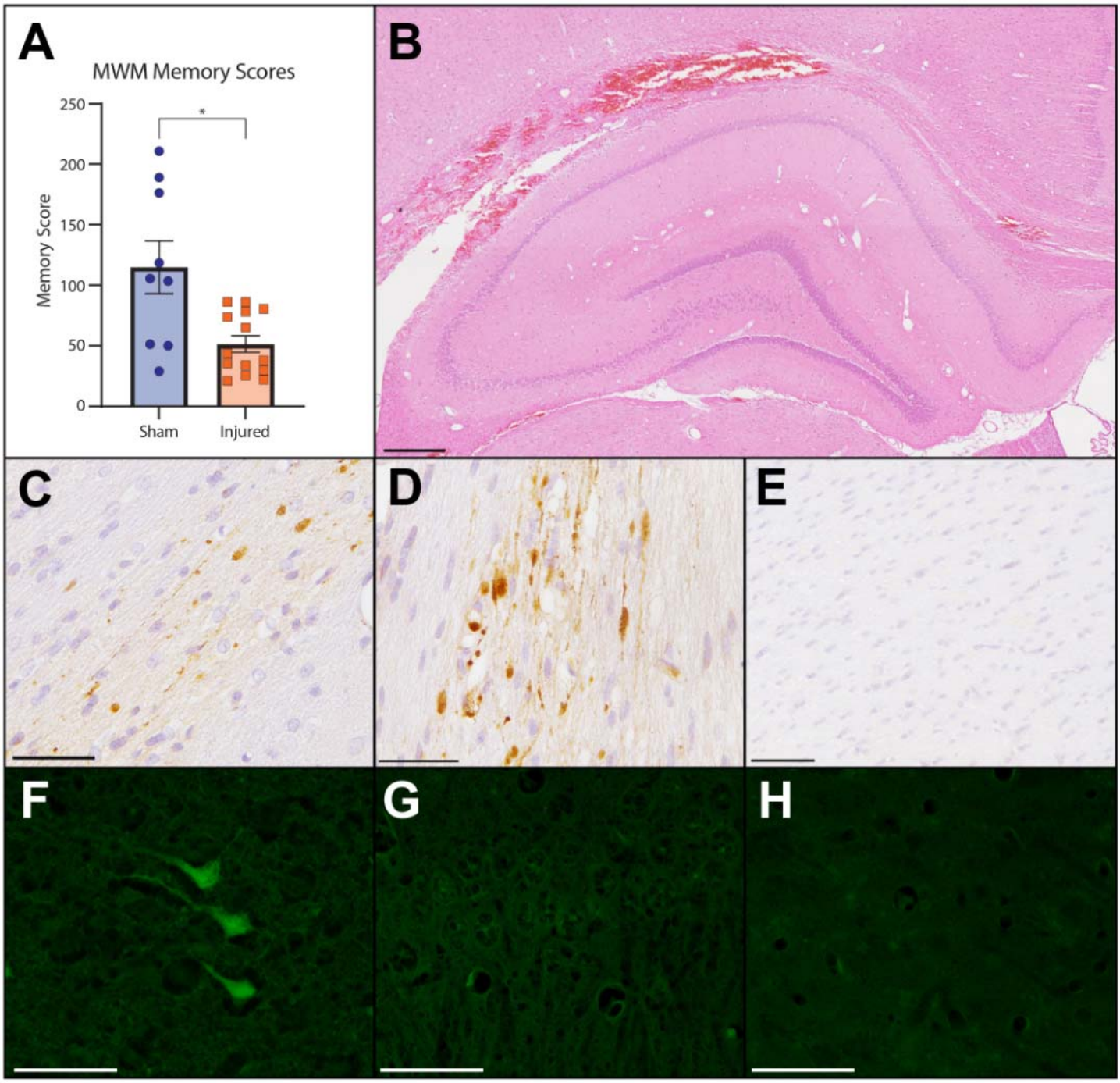
Supplementary Figure 1: ***Comparison of manual and automated clustering of cell types***

Scatter plots of spike width, first moment of the autocorrelogram, and firing rate for all single units located within the defined pyramidal cell layer. Left side shows manual clustering (matching **Fig 3B**) used for all analyses. Right side shows automated clustering (k-means consensus clustering with 2 groups). There was a 95.47% agreement between the two methods when unclassified cells were not included in the comparison. We chose to use manual clustering because inclusion of the unclassified group allowed us to be more conservative, and manual clustering is more robust to outliers in automated clustering such as the cell classified as a pyramidal cell with a firing rate of ~30 Hz.



<u>Supplementary Figure 2</u>: ***Cells above the defined pyramidal cell layer have features similar to interneurons***

Scatter plots of spike width, first moment of the autocorrelogram, and firing rate for all single units. Cells in purple were >80 µm above the defined *st. pyr* channel and were automatically identified as interneurons. These cells have firing properties matching interneurons and cluster around the interneuron group (see **Fig 3**).



Supplementary Figure 3: *$_L$FPI disrupts spatial memory and induces stereotypic pathologies*

(A) Morris water maze memory scores (mean±SEM; individual animals labeled by points) from sham and injured rats tested at 48hr post-injury (sham=114.8±21.8, n=9, injured=51.5±6.8, n=14, p=0.020; Welch's t-test).
(B) H&E-stained sections showing hemorrhagic contusion in the ipsilateral white matter, including the corpus callosum at 48 hr post-$_L$FPI. Note, the underlying hippocampus appears grossly intact (scale bar: 500 µm).
(C-D) APP immunoreactive axonal pathology in the angular bundle (C) and fimbria-fornix (D) at 48 hrs post-$_L$FPI (scale bars: 50 µm).
(E) An absence of axonal pathology in the fimbria-fornix 48 hrs following sham procedures (scale bar: 100 µm).
(F) Fluoro-Jade C positive neurons in the peri-lesional cortex at 48 hrs post-$_L$FPI (scale bar: 50 µm).
(G) An absence of Fluoro-Jade C positive cells in the CA1 region of hippocampus at 48 hrs post-$_L$FPI (scale bar: 50 µm).

(H) Ipsilateral cortex displaying an absence of Fluoro-Jade C positive cells following sham procedures (scale bar: 50 µm).