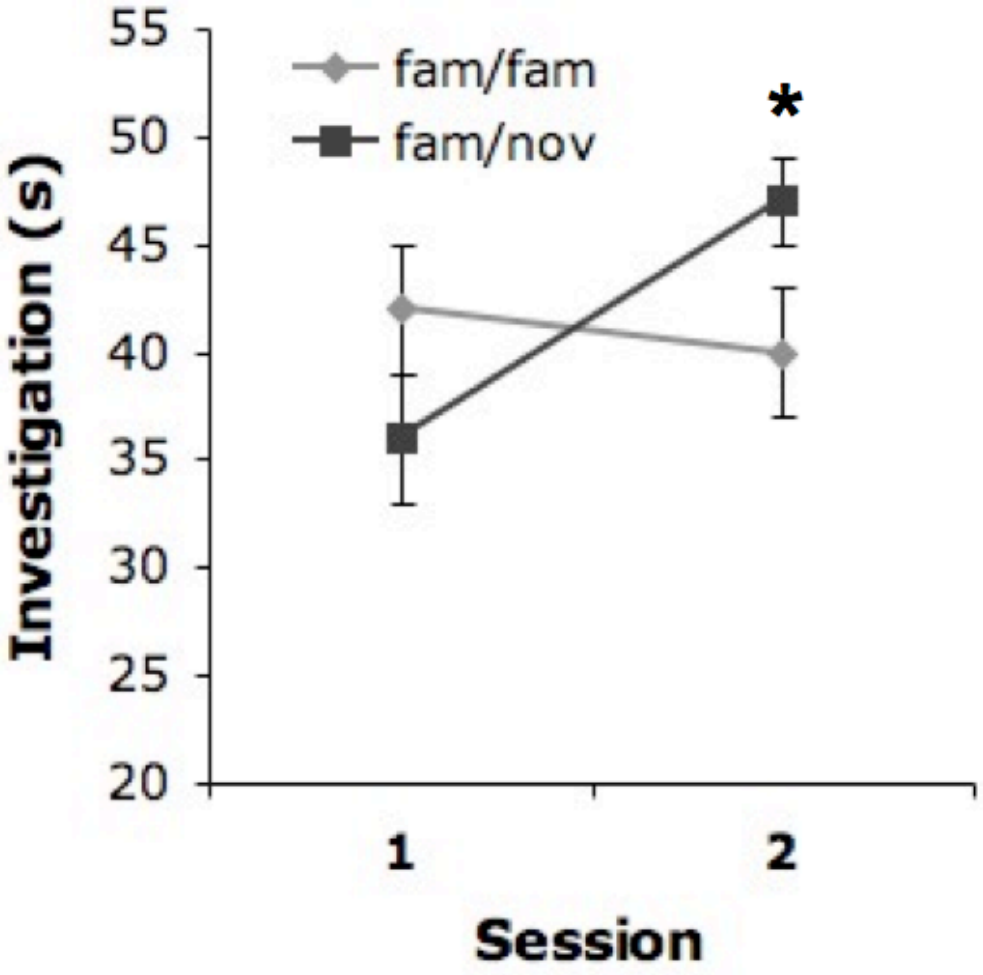
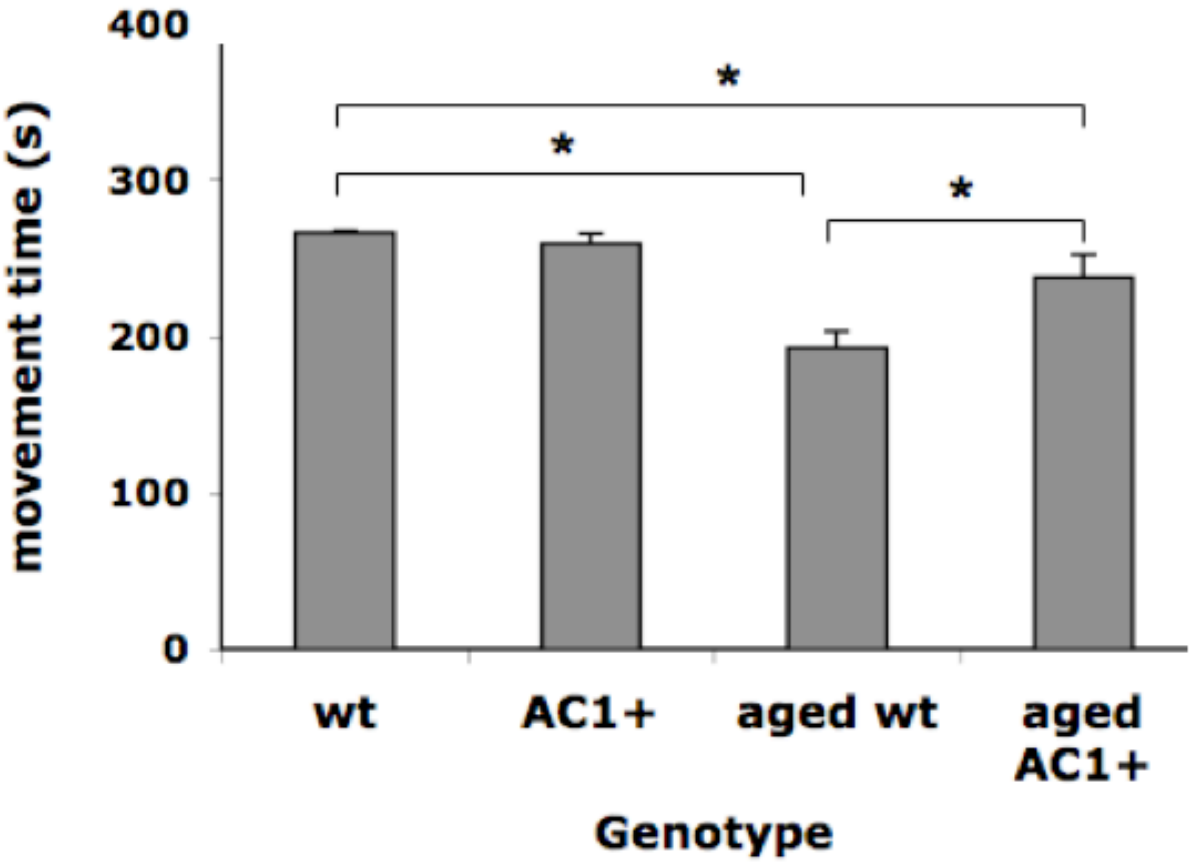
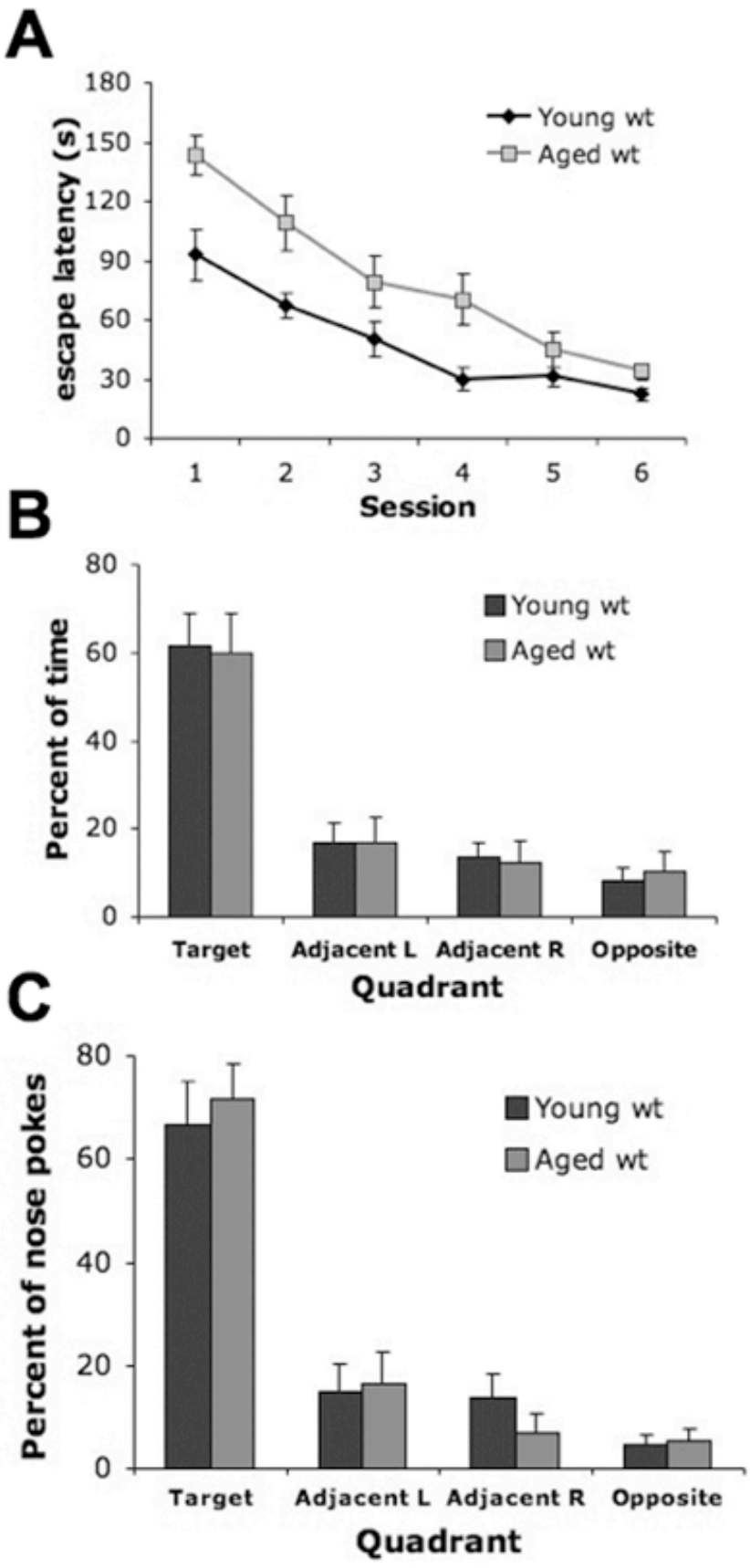
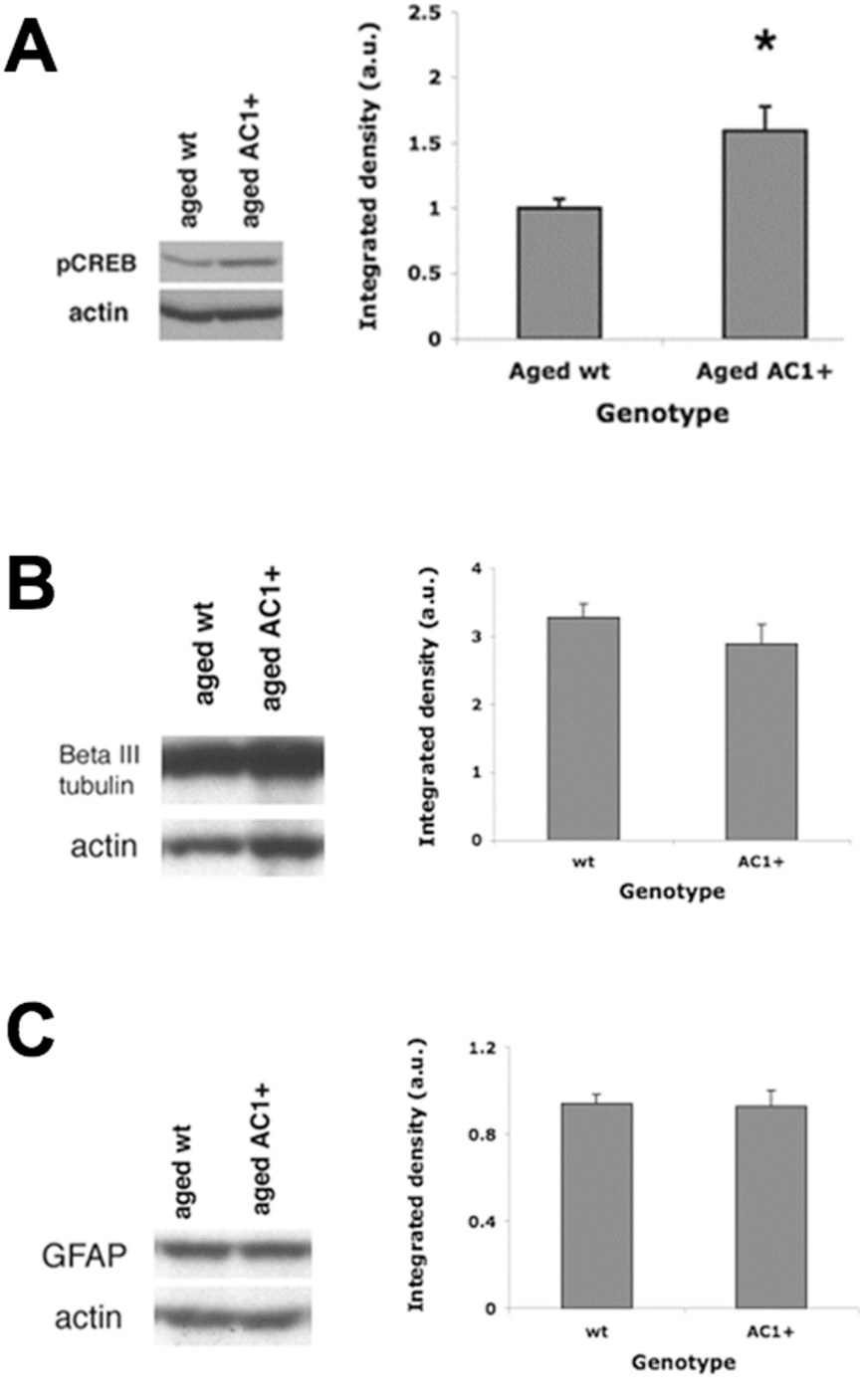

55
50
45
40
35
30
25
20
Investigation (s)
fam/fam
fam/nov
*
1
2
Session


400
300
200
100
0
movement time (s)
*
*
*
wt
AC1+
aged wt
aged AC1+
Genotype


A
180
150
120
90
60
30
0
escape latency (s)
Young wt
Aged wt
1
2
3
4
5
6
Session
B
80
60
40
20
0
Percent of time
Young wt
Aged wt
Target
Adjacent L
Adjacent R
Opposite
Quadrant
C
80
60
40
20
0
Percent of nose pokes
Young wt
Aged wt
Target
Adjacent L
Adjacent R
Opposite
Quadrant


A
aged wt
aged AC1+
pCREB
actin
Integrated density (a.u.)
2.5
2
1.5
1
0.5
0
*
Aged wt
Aged AC1+
Genotype
B
aged wt
aged AC1+
Beta III tubulin
actin
Integrated density (a.u.)
4
3
2
1
0
wt
AC1+
Genotype
C
aged wt
aged AC1+
GFAP
actin
Integrated density (a.u.)
1.2
0.8
0.4
0
wt
AC1+
Genotype

Supplemental Figure 1: Young adult wild type mice spent more time investigating a novel (nov) mouse than a familiar mouse it had been previously exposed to (fam) (n=13; $p < 0.01$). No preference was seen when the familiar mouse is exposed during both sessions (n=10). (* = $p < 0.05$, 2 way ANOVA with repeated measures across test, Bonferroni post test).

Supplemental Figure 2: Aged $AC1^+$ mice retain mobility. Young and old $AC1^+$ and wild type littermates were placed in a novel environment and movement time was recorded for five min (* = $p < 0.05$; 1 way ANOVA, Bonferroni post test: young $AC1^+$ n = 5, young wild-type n = 8, aged $AC1^+$ n = 6, aged wild-type n = 8).

Supplemental Figure 3: Aged wt mice have increased escape latency during training but similar performance on the probe test to young wt mice in the Barnes maze. A Aged mice have increased escape latency during the Barnes maze training sessions. (p 0.05; 2 way ANOVA with matched subjects across session). B and C, Barnes maze probe test. Aged mice spend similar amounts of time (B) and had similar amounts of nose pokes (C) in the target quadrant as young wt mice. (Young mice: n = 11; aged mice: n = 8).

Supplementary Figure 4. Levels phospho-CREB, neuronal markers, and glial markers in $AC1^+$ and wt littermate hippocampi. *A,* Representative western blot and analysis of phospho-CREB of hippocampus from aged $AC1^+$ and aged wt littermates. (* = $p < 0.05$, unpaired student's T test, n = 4). *B*, Representative blot and quantification of Beta III tubulin western analysis. *C*, Representative blot and quantification of GFAP western analysis. (A.U. = arbitrary units; all groups, n = 5).