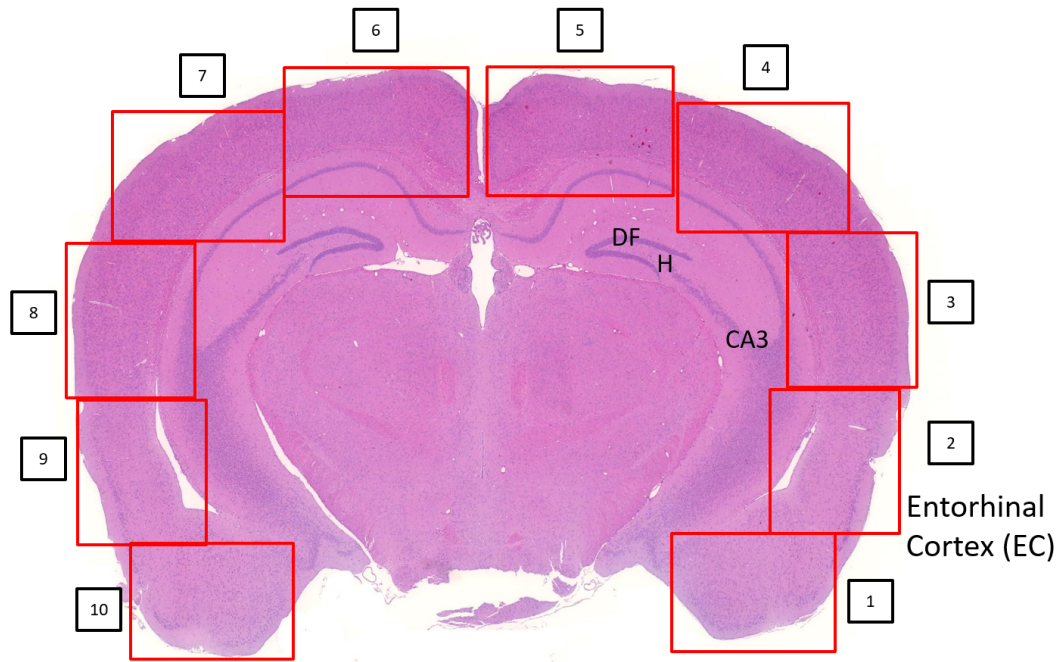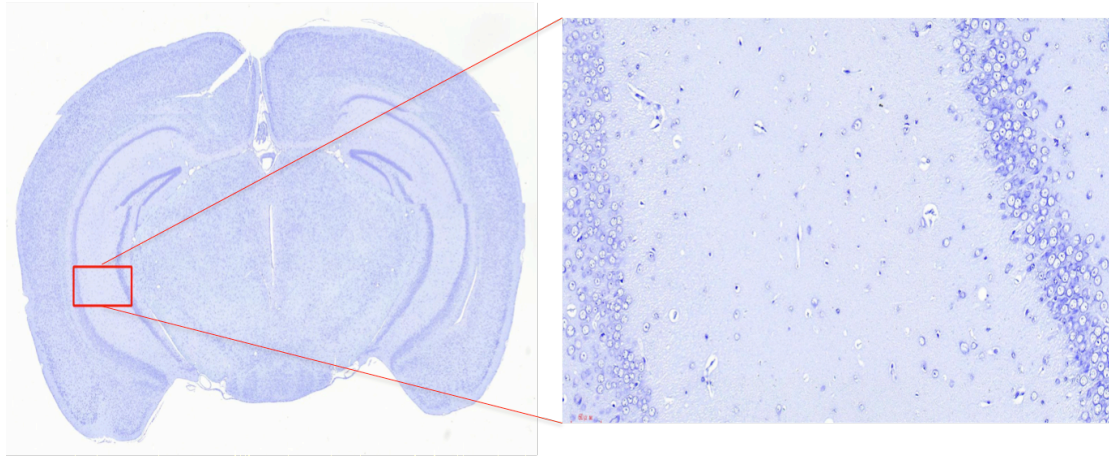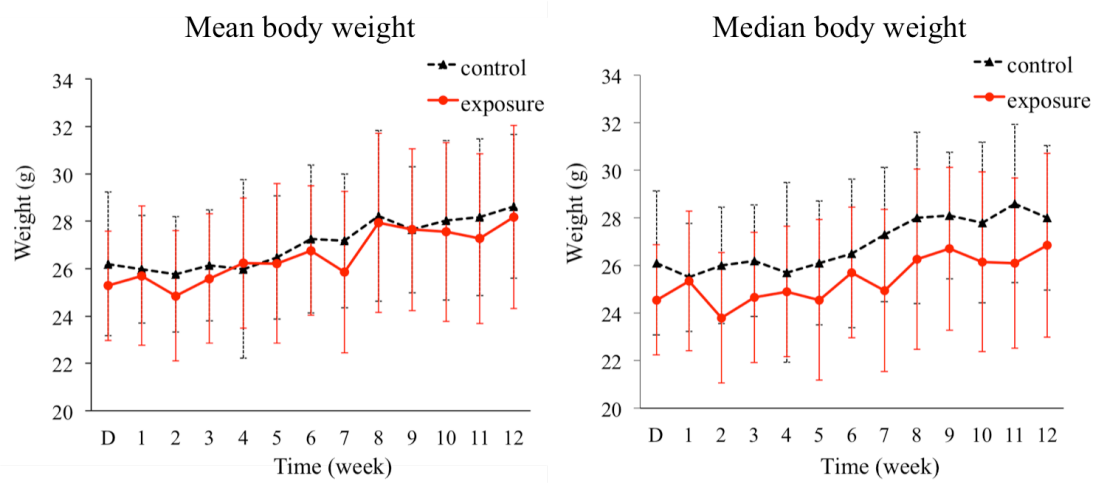**S1 File. The supplementary figures (S1-S7), tables (S1-S2), and raw western blot images.**

S1 Fig. **The representative view of mouse cortex for neural cell counting.**
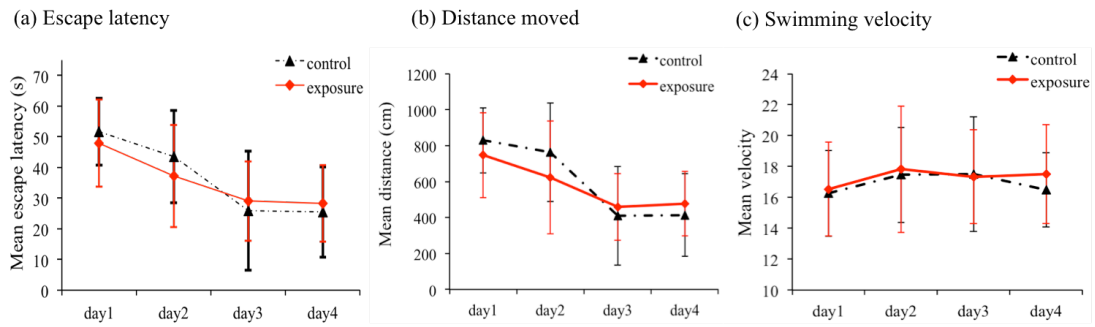
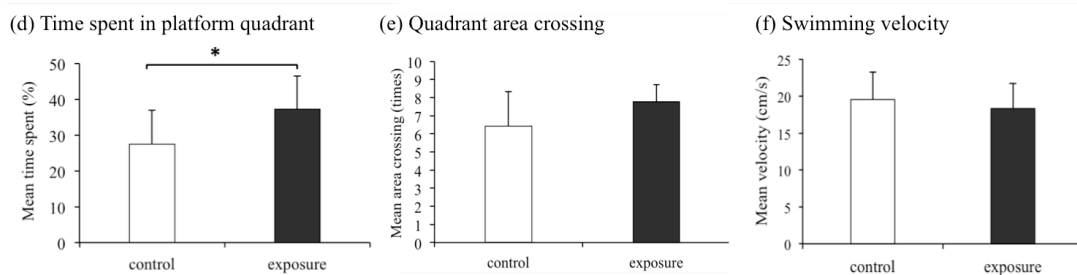**S2 Fig**. **The representative view of mouse hippocampus for neural cell counting.**

S3 Fig. **The boy weight of AD mice around three-month exposure period.**

Acquisition phase

(a) Escape latency (b) Distance moved (c) Swimming velocity

Probe trial

(d) Time spent in platform quadrant (e) Quadrant area crossing (f) Swimming velocity

S4 Fig. **The behavior performance of Morris Water Maze test after exposure.** The average escape latency (a), distance moved (b), and swimming velocity (c) for the acquisition phase (the first 4 days) as well as the average time spent in platform quadrant (d), quadrant area crossing (e), and swimming velocity (f) for the probe trial (the 5th day).
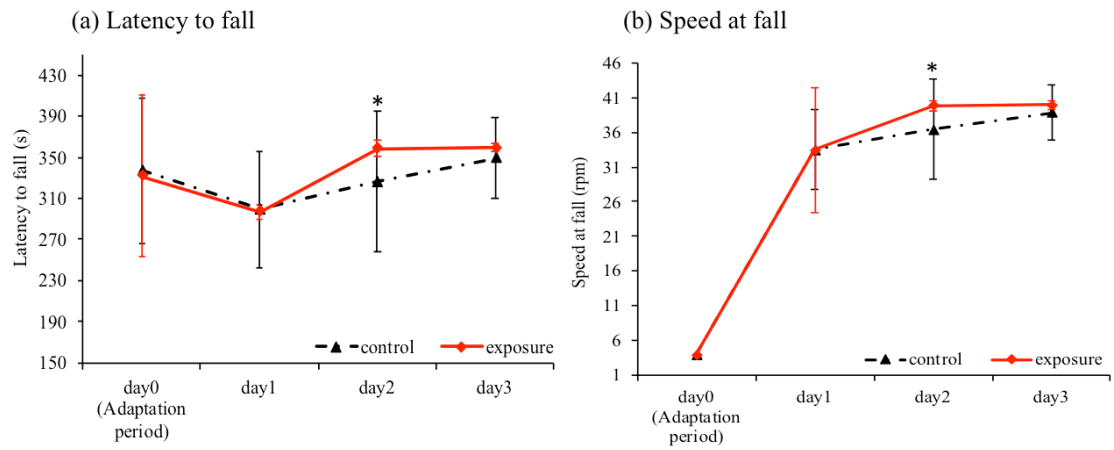
S5 Fig. **The behavior performance of rotarod test after exposure. The average latency to fall (a) and speed at fall (b) around four days.**
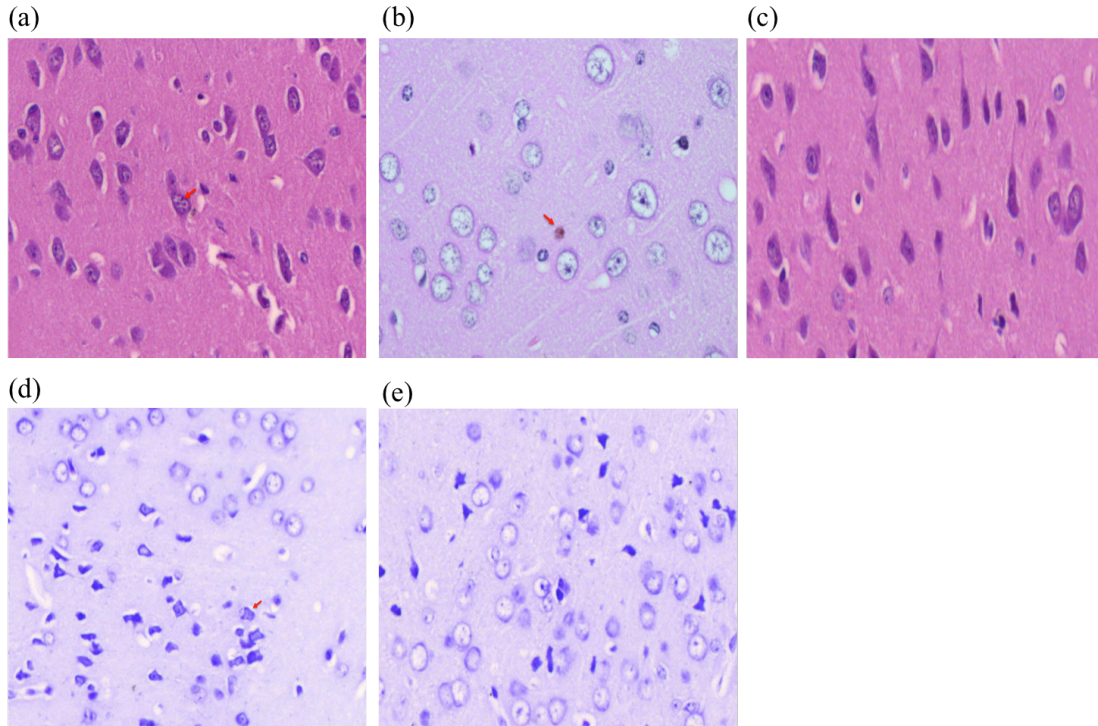
S6 Fig. **The histopathological views of neuronal morphological alterations in the AD mouse brains (400X).** In the representative H&E images, the granulovacuolar degeneration (a) and lipofuscin (b) were found in the $PM_{2.5}$ exposure group, but not in the control group (c). The results from nissl staining also showed the granulovacuolar degeneration in the certain $PM_{2.5}$-exposed mouse brain (d), but not in the control mouse brain (e).
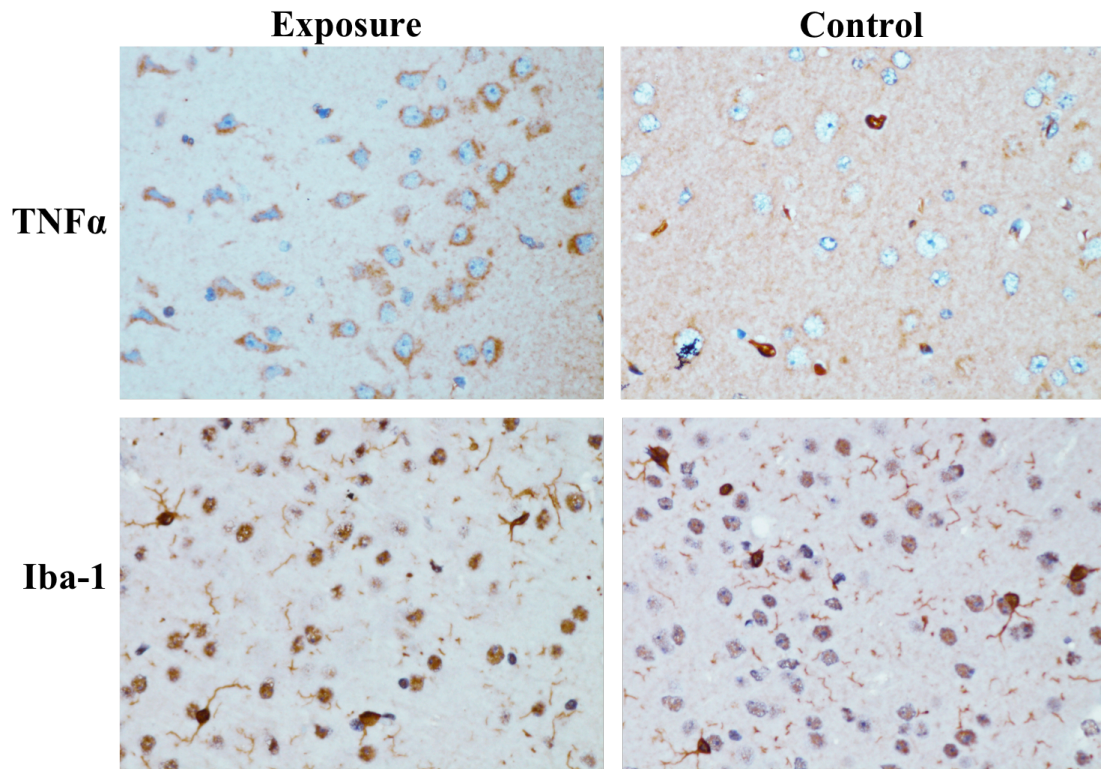
S7 Fig. The histopathological views of IHC staining (400X) of TNFα and Iba-1 in the cortex of AD mice in the $PM_{2.5}$ exposure or control group.

S1 Table. **The total metal ion composition of the PM$_{2.5}$ around exposure period.**

	Mean (ng/m^3)	Median (ng/m^3)	SD (ng/m^3)	Min (ng/m^3)	Max (ng/m^3)
Al	66.4	72.6	27.4	28.7	110.7
Fe	94.5	91.3	30.3	64.5	152.5
Na	165.8	168.5	32.6	119.4	229.6
Mg	38.9	37.7	12.2	22.8	59.6
K	159.5	154.8	101.9	53.2	368.3
Ca	282.9	254.0	101.8	170.9	511.4
Sr	1.3	0.8	2.2	0.4	6.9
Ba	3.0	2.1	4.4	1.0	14.5
Ti	5.8	5.8	2.0	4.0	10.4
Mn	8.6	8.3	2.9	4.6	13.2
Co	0.1	0.1	0.0	0.1	0.1
Ni	4.0	3.6	1.7	2.4	7.3
Cu	5.7	4.3	2.9	4.2	12.6
Zn	20.2	18.0	5.9	13.3	31.7
Mo	0.5	0.4	0.2	0.3	1.0
Cd	0.2	0.2	0.1	0.1	0.5
Sn	2.1	2.0	0.9	1.0	3.4
Sb	0.9	0.7	0.5	0.4	2.2
Tl	0.1	0.0	0.0	0.0	0.1
Pb	10.2	7.1	5.7	3.6	21.3
V	5.9	5.7	1.7	3.6	8.7
Cr	3.0	2.7	1.2	2.2	5.8
As	0.9	0.8	0.3	0.4	1.5

S2 Table. **The water-soluble metal ion composition of the PM$_{2.5}$ around exposure period.**

	Mean (ng/m^3)	Median (ng/m^3)	SD (ng/m^3)	Min (ng/m^3)	Max (ng/m^3)
Al	10.5	10.5	7.0	4.1	25.3
Fe	17.3	20.0	8.3	6.8	27.7
Na	107.8	116.0	15.6	77.8	130.8
Mg	16.5	16.6	7.0	9.4	33.7
K	124.3	138.8	72.5	45.7	278.9
Ca	31.3	23.1	19.3	17.7	74.3
Sr	0.9	0.4	2.1	0.2	6.4
Ba	2.3	1.2	3.9	0.8	12.5
Ti	0.5	0.4	0.2	0.3	0.8
Mn	4.6	4.8	1.9	2.3	7.6
Co	0.0	0.0	0.0	0.0	0.0
Ni	1.2	1.2	0.4	0.7	2.0
Cu	3.1	2.6	2.3	1.5	8.6
Zn	23.7	22.9	7.1	15.4	37.5
Mo	0.2	0.2	0.1	0.1	0.4
Cd	0.2	0.1	0.1	0.1	0.4
Sn	0.3	0.3	0.2	0.1	0.6
Sb	0.5	0.4	0.3	0.1	1.0
Tl	0.0	0.0	0.0	0.0	0.1
Pb	5.7	4.0	3.6	1.5	13.4
V	3.7	3.6	1.3	1.7	5.8
Cr	0.4	0.4	0.1	0.2	0.7
As	0.7	0.7	0.3	0.3	1.1