



Figure S1 Expression level of PDE4D in hippocampus region of mouse brain, and schematic illustration of design and construction of recombinant AAV vectors. (A, B) A schematic illustration of design and construction of recombinant AAV-miR-139-5p and AAV-miR-139-5p sponge. Relative PDE4D mRNA (C) and protein (D) expression were quantified by qPCR and western blotting, respectively. *** $P \leq 0.01$ versus the control group. All data are presented as mean \pm SEM. PDE4D, phosphodiesterase 4D; AAV, adeno-associated virus.

Table S1 Sequences of the oligo primers used in this study

Primers	Primer sequence	
	Forward (5'-3')	Reverse (5'-3')
miR-139-5p	ACACTCCAGCTGGGTCTACAGTGCACGTGTC	ACTGACTGATGCAATCTCAACTGGTGTCTCGTGA
miR-335-5p	UGUUUUGAGCGGGGUCAAGAGC	CUCUCAUUUGCUAUUUUCA
miR-340-5p	CCGTTAGTTACGATTCGAAG	AGGCCGCGCGTAGTGATGCAACA
miR-7-5p	GCGCTGGAAGACTAGTGATTTTGTGTT	CTCGCTTCGGCAGCACA
miR-103a-3p	ACACTCCAGCTGGGAGCAGCATTGTACAGGG	TGGTGTCTGGAGTCG
miR-19b-3p	TCCGAAGTCAAACGTCACCTA	GTGCAGGGTCCGAGGT
miR-18a-5p	TAAGGTGCATCTAGTGACAGAT	GAACATGTCTGCGTATCTC
miR-16-5p	TAGCAGCACGTAAATATTGG	GAACATGTCTGCGTATCTC
PDE4D	AAGTCTATGTCCAGGAACCTCTCG	TAACGCAGCAAAGTTGTTCCGTAC
BDNF	TCATACTTCGGTTGCATGAAGG	AGACCTCTCGAACCTGCC
GAPDH	AAGGGCTCATGACCACAGTC	GGATGCAGGGATGATGTTCT

PDE4D, phosphodiesterase 4D; BDNF, brain-derived neurotrophic factor.

Table S2 List of antibodies used for western blot and immunofluorescence

Antigen	Manufacturer	Application	Dilution
PDE4D	FabGenni, (PD4-401AP), rabbit monoclonal	WB	1:500
CREB	CST, (Cat. #9197), rabbit monoclonal	WB	1:1,000
p-CREB	CST, (Cat. #9198), rabbit monoclonal	WB	1:1,000
BDNF	Abcam, (Cat. #ab108319), rabbit monoclonal	WB	1:1,000
		IF	1:200
GAPDH	Millipore, (Cat. #ABS16), rabbit monoclonal	WB	1:2,000
BrdU	CST, (Cat. #5292), mouse monoclonal	IF	1:500
DCX	CST, (Cat. #4604), rabbit monoclonal	IF	1:300
Nestin	CST, (Cat. #33475), mouse monoclonal	IF	1:1,000

PDE4D, phosphodiesterase 4D; p-CREB, phosphorylated cyclic-AMP response element-binding protein; BDNF, brain-derived neurotrophic factor; BrdU, bromodeoxyuridine; DCX, doublecortin.