Table SI. PCR primers for Sanger sequencing.

Gene	Genomic coordinates (GRCh37)	Product length, bp	Forward primer 5'→3'	Reverse primer 5'→3'
PCDHA6	chr5:140209767-140210016	250	CGTGTACCTGATCATCGCCA	AGGACAAGGTGAAAGGCTGG
COL3A1	chr2:189873742-189874155	414	TGGGATTGGAGGTGAAAAAG	TTTCTGTATTTGGCATGATCTGA
NCOA7	chr6:126201975-126202537	563	GCCTTGCTCTCCCTTTCTTT	GCCATTTTTGCCTTTGAAAC

Chr, chromosome.

Table SII. Mutant genes identified in the present study.

Genes	Genomic coordinates (GRCh37)	Variation	AA change	Protein size	Function
PCDHA1, *PCDHA2*, *PCDHA3*, *PCDHA4*, *PCDHA5*, *PCDHA6*, *PCDHA7*,	chr5: 140207766-140215463	CNV-dup	unknown	950, 948, 950, 947, 936, 950, 937,	Calcium-dependent cell-adhesion proteins. May participate in the establishment and maintenance of specific neuronal connections in the brain (27).
COL3A1	chr2: 189873899	G→A	p.A1259T	1466	Present in most soft connective tissues together with type I collagen. Participates in the regulation of cortical development. It is the main ligand of ADGRG1 protein in the developing brain. Binding to ADGRG1 may inhibit neuronal migration and activate the RhoA pathway by coupling ADGRG1 with GNA13 and possibly GNA12 (45).
NCOA7	chr6: 126202268	CAGT→C	p.S165del	942	Enhances the transcriptional activity of a variety of nuclear receptors. Participates in the coactivation of different nuclear receptors, such as ESR1, RARA, PPARG and THRB (42).

Chr, chromosome; CNV, copy number variation; AA, amino acid.

Table SIII. Phenotypes of candidate gene knockout mice.

A, *PCDHA*

Model	Mutant mouse phenotype	Disease/source
MGI:3829207	Abnormal serotonin level: Compared with wild-type mice, 5-HT levels in the hippocampus are increased (46).	-
MGI:3829205	i) Brain morphology is normal. ii) Abnormal serotonin level: 5-HT levels in the hippocampus are increased (46).	-
MGI:4356105	i) Abnormal serotonin level: The level of serotonin is higher in the hippocampus at 10 weeks. ii) Abnormal hippocampus and dentate gyrus morphology: Serotonergic fibers are increased in the lacunosum-moleculare (170%), but decreased in the dentate gyrus (41%). iii) Abnormal serotonergic fibers in the cerebral cortex, hippocampus, basal ganglia and thalamus (39).	-
MGI:4356106	i) Cortical barrel fields are normal in structure. ii) Increased serotonin level: The level of serotonin is higher in the hippocampus at 10 weeks. iii) Abnormal substantia nigra and globus pallidus morphology: The density of serotonergic fibers is increased in the peripheral region and decreased in the central region. iv) Abnormal dorsal striatum morphology: The density of serotonergic fibers is decreased in the caudate putamen. v) Abnormal thalamus, lateral geniculate nucleus and medial geniculate nucleus morphology: Serotonergic fibers accumulate around the dorsal lateral geniculate nucleus and the medial geniculate nucleus but are sparse in the central regions of these nuclei. vi) Abnormal cingulate gyrus morphology: The density of serotonergic fibers is decreased in the cingulate cortex. vii) Abnormal entorhinal cortex morphology: The density of serotonergic fibers is higher in the entorhinal cortex. viii) Abnormal hippocampus morphology: Serotonergic fibers are increased in the lacunosum-moleculare (184%) and the stratum radiatum (134%) of the CA1 region. Serotonergic fibers are decreased in the stratum oriens (44%) and dentage gyrus (21%). ix) Abnormal dentate gyrus morphology: Serotonergic fibers are decreased 21% in the dentage gyrus. x) Abnormal primary motor cortex morphology: Serotonergic fibers more densely innervated in layer I and short in the rostral part of the primary motor cortex; clumped fibers are frequently observed in layer II/III of only the most rostral part of the primary motor cortex. xi) Abnormal olfactory bulb morphology: Decreased number of serotonergic fibers in the layers encompassed by and including the external and internal plexiform layers. Increased number of serotonergic fibers in the granule cell layer.	-

	xii) Abnormal serotonergic neuron morphology: Abnormal serotonergic fibers in the cerebral cortex, hippocampus, basal ganglia and thalamus (39).	
MGI:3799112	Abnormal olfactory bulb morphology: Glomeruli are increased but small (47).	-
B, *COL3A1*		
Model	Mutant mouse phenotype	Disease/source
MGI:2664355	i) Cobblestone-like cortical malformation. ii) The pial basement membrane is obviously disrupted with neuronal overmigration. iii) Abnormal attachment of radial glial endfeet. iv) Misplacement of both Cajal-Retzius cells and interneurons. v) Development of meningeal fibroblasts is normal. vi) Expression level of α-dystroglycan is normal (41). vii) Muscle phenotype: The overall arrangement of elastic fibers and smooth muscle cells is normal (48).	-
MGI:5307019	i) Abnormal aorta smooth muscle morphology: Tearing ii) Increased vasoconstriction responds to 5-HT. However, denuded aorta performs normal constriction in response to 5-HT (49).	Ehlers-Danlos syndrome, vascular type (OMIM:130050) Polymicrogyria with or without vascular-type EDS (OMIM:618343)
C, *NCOA7*		
Model	Mutant mouse phenotype	Disease/source
MGI:6714041	i) No obvious brain morphology abnormality. ii) Abnormal cerebral cortex morphology: Increased number of proximal neurites on the cortical neuron protrusions. Decreased quantity of calbindin-positive interneurons in the somatosensory and visual cortex. iii) Abnormal inhibitory synapse morphology: The inhibitory contact on cortical and somatosensory cortex neurons is reduced. However, the number of inhibitory contacts on cortical and somatosensory cortex neurons is normal (44).	-

OMIM, Online Mendelian Inheritance in Man; 5-HT, 5-hydroxytryptamine; MGI, mouse genome informatics.