

Table S1. Association of TDP-43 and/or FMRP with AD and Schizophrenia

Diseases	Facts	References
Alzheimer's Disease (AD)	TDP-43 pathology is detected in 25% to 50% of AD cases.	[20]
	FMRP induces dendritic spine shrinkage and loss that contribute to AD pathogenesis in conjunction with Rac1 and CYFIP1/2.	[1]
	FMRP-target genes, e.g. App etc. are involved in AD pathogenesis and disease severity. App is one of the target mRNAs of TDP-43.	[18, 19]; Current MS (data not shown).
Schizophrenia	Schizophrenia-like symptoms are associated with patients with FTD, and TDP-43 pathology has been depicted as one of the molecular mechanisms behind the psychosis.	[7]
	FMRP pathology is present in schizophrenia patients with lower IQ and early onset of the disease phenotypes	[11]
	Expression levels of FMRP target mRNAs including Rac1, App etc. are altered in a subpopulation of schizophrenia patients with or without known fmr1 gene mutations	[9]

Table S2. Target mRNA databases of FMRP and TDP-43 used for identification of their putative common mRNA targets.

	Reference	RNA source	Techniques/Approaches	Number of target mRNAs included in the present analysis
FMRP targets	[4]	Mouse brain extract	RNA IP followed by microarray	232
	[8]	Mouse brain extract	CLIP-chip assay	842
	[5]	Human brain tissue extract	Modified cDNA-SELEX protocol	32
	[13]	Primary cultured mouse hippocampal cells	APRA followed by neuroarray	33
	[2]	HEK293 cells stably expressing HA-FMRP (shares 90% of brain mRNAs according to RNA sequencing dataset)	PAR-CLIP assay	1,719
TDP-43 targets	[6]	NSC-34 cells	RNA IP chip (microarray)	2,637
	[14]	Mouse brain extract	RNA IP chip (microarray)	1,839
	[15]	Mouse brain extract	CLIP microarray	223
	[16]	Mouse brain extract	RNA IP followed by RNA sequencing	3,694
	[21]	SHSY5Y cells	UV-CLIP assay	68

Table S3. List of putative common target mRNAs of FMRP and TDP-43 that encode genes related to neuronal structure and development.

Gene Symbol	Functional annotation
ABL1	non-receptor tyrosine protein kinase
ACTR3	actin and actin-related protein
ADCY1	adenylate cyclase, guanylate cyclase
AGAP2	nucleic acid binding, G-protein modulator
AGRN	receptor, extracellular matrix linker protein
AKAP9	chromatin/chromatin-binding protein, hydrolase, kinase modulator
ALS2	chromatin/chromatin-binding protein, guanyl-nucleotide exchange factor
ANK1	cytoskeletal protein
ANK2	cytoskeletal protein
ANK3	cytoskeletal protein
AP2A2	transmembrane receptor regulatory/adaptor protein
AP2S1	vesicle coat protein
APBB1	signaling molecule
APC	
APOE	
APP	signaling molecule
ARF4	small GTPase
ARHGAP35	G-protein modulator
ARHGAP39	cytoskeletal protein
ARHGEF11	guanyl-nucleotide exchange factor
ARHGEF12	guanyl-nucleotide exchange factor
ARHGEF7	signaling molecule, guanyl-nucleotide exchange factor
ARPC2	
ARPC5	actin family cytoskeletal protein
ATG7	transfer/carrier protein, ligase
ATP2B2	cation transporter, ion channel, hydrolase
BRSK1	non-receptor serine/threonine protein kinase
BRSK2	non-receptor serine/threonine protein kinase
CACNA1A	voltage-gated calcium channel, voltage-gated sodium channel, voltage-gated ion
CACNA1G	voltage-gated calcium channel, voltage-gated sodium channel, voltage-gated ion
CACNA1I	voltage-gated calcium channel, voltage-gated sodium channel, voltage-gated ion
CACNB1	voltage-gated calcium channel, voltage-gated ion channel
CALM1	calmodulin
CAMK2A	non-receptor serine/threonine protein kinase
CAMK2B	non-receptor serine/threonine protein kinase
CAMSAP1	
CAPZB	non-motor actin-binding protein
CDK5R1	kinase activator
CELSR2	G-protein-coupled receptor, cadherin
CELSR3	G-protein-coupled receptor, cadherin
CIT	non-receptor serine/threonine protein kinase
CLASP2	structural protein
CLTA	vesicle coat protein

COBL	
DCLK1	non-receptor serine/threonine protein kinase
DNM1	hydrolase, small GTPase, microtubule family cytoskeletal protein
DPYSL2	hydrolase
DSCAML1	immunoglobulin receptor superfamily, protein phosphatase, immunoglobulin
DYNLT1	microtubule family cytoskeletal protein
EPHA4	
EPHB6	
FRY	
FYN	non-receptor tyrosine protein kinase
GAS7	membrane trafficking regulatory protein, actin family cytoskeletal protein
GRIA1	ionotropic glutamate receptor
GPM6A	myelin protein
GRB2	
GRIN2A	ionotropic glutamate receptor
GRIN2B	ionotropic glutamate receptor
GRIN2C	ionotropic glutamate receptor
GSK3B	non-receptor serine/threonine protein kinase
HSP90AA1	Hsp90 family chaperone
HTT	
IFT20	
IGF1R	
IRS2	
ITGB1	receptor, extracellular matrix glycoprotein, cell adhesion molecule
ITSN1	membrane traffic protein, G-protein modulator, calcium-binding protein
JAK1	non-receptor tyrosine protein kinase
JAK2	non-receptor tyrosine protein kinase
JUN	transcription factor, nucleic acid binding
KALRN	signaling molecule, guanyl-nucleotide exchange factor
KCNQ2	voltage-gated potassium channel, voltage-gated ion channel
KCNQ3	voltage-gated potassium channel, voltage-gated ion channel
KIF5A	microtubule binding motor protein
KIF5C	microtubule binding motor protein
KITLG	growth factor, membrane-bound signaling molecule, cell adhesion molecule
LAMB2	receptor, extracellular matrix linker protein
LLGL1	membrane trafficking regulatory protein
LPPR4	
MAP1B	non-motor microtubule binding protein
MAP1S	non-motor microtubule binding protein
MAP2	
MAP4K4	
MAPK1	non-receptor serine/threonine protein kinase
MAPK8IP3	kinase modulator
MEF2C	

MYCBP2	
MYH10	G-protein modulator, actin-binding motor protein, cell junction protein
MYL12B	actin family cytoskeletal protein, calmodulin
MYO10	G-protein modulator, actin-binding motor protein, cell junction protein
NCAM1	immunoglobulin receptor superfamily, protein phosphatase, immunoglobulin
NEDD4	ubiquitin-protein ligase
NF1	signaling molecule, G-protein modulator
NLGN3	esterase, lipase
NRP1	transporter, apolipoprotein, membrane-bound signaling molecule, receptor,
NRXN1	transporter, apolipoprotein, membrane-bound signaling molecule, receptor,
NRXN3	Transporter, apolipoprotein, membrane-bound signaling molecule, receptor,
NTRK2	
OGDH	
PBX3	DNA-directed RNA polymerase
PDGFB	growth factor
PGRMC1	signaling molecule, receptor
PHGDH	dehydrogenase
PIP5K1C	kinase
PLXNA2	tyrosine protein kinase receptor, signaling molecule, protein kinase
PLXNB1	
PLXND1	tyrosine protein kinase receptor, signaling molecule, protein kinase
PPP5C	protein phosphatase, calcium-binding protein
PPT1	esterase
PREX2	guanyl-nucleotide exchange factor
PRICKLE2	structural protein, actin family cytoskeletal protein
PSMA5	
PSMA7	
PSMB2	
PSMD11	
PSMD13	enzyme modulator
PSMD3	enzyme modulator
PSMD6	
PSME3	
PSME4	
PSMF1	protease inhibitor
PTEN	protein phosphatase
PTK2	non-receptor tyrosine protein kinase
PTK2B	non-receptor tyrosine protein kinase
PTPN11	protein phosphatase
PTPRF	protein phosphatase
RAB10	
RAB11A	
RAC1	small GTPase
RAC3	small GTPase

RAPGEF2	guanyl-nucleotide exchange factor
RASA3	signaling molecule, G-protein modulator
RASGRF1	guanyl-nucleotide exchange factor
RBFOX2	RNA binding protein
RELN	
RERE	
RTN4	membrane traffic protein
RTN4R	cytokine, receptor, extracellular matrix protein
SHANK1	
SHANK3	
SNAPIN	
SOS2	guanyl-nucleotide exchange factor
SPRED1	receptor
SPTAN1	non-motor actin-binding protein
SPTBN1	non-motor actin-binding protein
SRGAP2	G-protein modulator
SYNGAP1	signaling molecule, G-protein modulator
TBC1D24	G-protein modulator
TLN1	actin family cytoskeletal protein, cell adhesion molecule
TNIK	
TRIM32	
ULK1	non-receptor serine/threonine protein kinase
ULK2	non-receptor serine/threonine protein kinase
UNC5A	receptor
USP9X	
VEGFA	growth factor
WNK1	non-receptor serine/threonine protein kinase
XBP1	
YWHAB	chaperone

Table S4. List of primers used in molecular cloning.

Name	Sequence
Luc-5'UTR F	5'-ATGCCTCGAGCTTTGGGTGGTGGCTGCT-3'
Luc-5'UTR R	5'-ATGCGCGGCCGCTTGATGGCCTGCATCTGG-3'
Luc-3'UTR F	5'-ATGCCTCGAGCCCTCGTTCTCGGTCCTG-3'
Luc-3'UTR R	5'- ATGCGCGGCCGCTTCATACATGCAAAACATACTGC- 3'
Luc-3'UTR R1	5'-ATGCGCGGCCGC GAGCAAGAATGGGGGATTTT- 3'
Luc-3'UTR F2	5'-ATGCCTCGAGCCCTCGTTCTCGGTCCTG-3'
Luc-3'UTR R2	5'-ATGCGCGGCCGCGTCACACGGTCTGGGAACTC- 3'
Luc-3'UTR F3	5'-ATGCCTCGAGAGCACAGCCTCCTTAATGACA-3'
Luc-3'UTR R3	5'- ATGCGCGGCCGCCATTTGTCACCTACTGTTTG-3'
Luc-3'UTR F4	5'-ATGCCTCGAGCGATCTTATCAGTGTCTCTTGAG- 3'
Luc-CDS F	5'-ATGCCTCGAG AGGCCATCAAGTGTGTGGTGGT- 3'
Luc-CDS R	5'- ATGCGCGGCCGCCAACAGCAGGCATTTTCTCTTC-3'
TransL-3'UTR F	5'-ATGCGCGGCCGC CCCTCGTTCTCGGTCCTG-3'
TransL-3'UTR R	5'-ATGCCTTAAGTTCATACATGCAAAACATACTGC- 3'

F - forward primers

R - reverse primers

Table S5. List of primers used for RT-PCR analysis.

Name	Sequence
HDAC6 F	5'-CTCGGAGTTTCAGCCTCAAC-3'
HDAC6R	5'-AGCACTGACTCCCTTAGCCA-3'
PSD95F	5'-GAGTGACAGCTATGCTCCCC-3'
PSD95R	5'-ATGAAGATGCCTTCACCGTC-3'
Rac1F	5'-GTACATCCCCACCGTCTTTG-3'
Rac1R	5'-ACAGTGGTGTGCGCACTTCAG-3'
CamKII F	5'-AAAGTGCGCAAACAGGAAAT-3'
CamKII R	5'-AGGTGGATGTGAGGGTTCAG-3'
Map1b	5'-TGGGACACAAACCTGATTGA-3'
Map1b	5'-TGAAAATCTCTATGAAGTTCT-3'
mTOR	5'-GCAAGTTCAGCCCTTCTTTG-3'
mTOR	5'-GTACCACTGAGGCTTCTGCAT-3'
GluR1F	5'-CTAGGCTGCCTGAACCTTTG-3'
GluR1R	5'-GGGAAGATTGAATGGAAGCA-3'
GAPDH F	5'-GGTCATCCATGACAACCTTTGG-3'
GAPDH R	5'-TCTTACTCCTTGGAGGCCATG-3'

Table S6. List of primers used to generate T7 promoter-tagged DNA templates for *in vitro* transcription.

Name	Sequence
Rac1 5'UTR-F	5'-ATGCATTAATACGACTCACTATAGGG CTTTGGGTGGTGGCTGCT-3'
Rac1 5'UTR-R	5'-TTGATGGCCTGCATCTGG-3'
Rac1 3'UTR-1F	5'-ATGCATTAATACGACTCACTATAGGG GGAACCTTTGTACGCTTTC-3'
Rac1 3'UTR-1R	5'-GAGCAAGAATGGGGGATTTT-3'
Rac1 3'UTR-2F	5'-ATGCATTAATACGACTCACTATAGGG CCCTCGTTCTCGGTCTG-3'
Rac1 3'UTR-2R	5'-GTCACACGGTCTGGGAAGTC-3'
Rac1 3'UTR-3F	5'-ATGCATTAATACGACTCACTATAGGG GACACAGCACAGCCTCCTTA-3'
Rac1 3'UTR-3R	5'-ATCGGCCATTTGTCACCTAC-3'
Rac1 3'UTR-4F	5'- ATGCATTAATACGACTCACTATAGGGCGAT CTTATCAGTGTCTCTTGAGC-3'
Rac1 3'UTR-4R	5'-TTCATACATGCAAACATACTGC-3'
Rac1 3'UTR-3F1	5'- ATGCATTAATACGACTCACTATAGGGGAGCA CAGCCTCCTTAATGACA-3'
Rac1 3'UTR-3R1	5'-GCCATTTGTACCTACTGTTTG-3'
Rac1 3'UTR-2MR	5'-TTAGTTCAGAAGGTATTTTGGC -3'
Rac1 3'UTR-2MF	5'-CTTCTGAACTAAATTCGCTCTTCGG -3'
Rac1 3'UTR-3M1R	5'-AGGAACCAGAGTTCTGTTCAA-3'
Rac1 3'UTR-3M1F	5'- GAACTCTGGTTCGGCGATCC-3'
Rac1 3'UTR-3MR	5'-CAGCAAACCGAGAAGTAGGAA-3'
Rac1 3'UTR-3MF	5'-GCTGGGTGGAGTGGGAAAC-3'
Rac1 3'UTR-3M2R	5'-TCATTGTGACGTACAGTACAAAGTTAC-3'
Rac1 3'UTR-3M2F	5'-CACAAATGATAAGCGTGACAGC-3'
Rac1 CDS F	5'- ATGCATTAATACGACTCACTATAGGGCCAG ATGCAGGCCATCAAG-3'
Rac1 CSM F	5'- ATGCATTAATACGACTCACTATAGGGAGTG AGAAATGGTGGGAGACG-3'
Rac1 CDS R	5'-GAAGAGAAAATGCCTGCTGTTG-3'