# Genetic topography and cortical cell loss in Huntington's disease link development and neurodegeneration

Supplementary Data

## Figure 1 Map depicting the cortical T values obtained from the volumetric analysis comparing HD expansion carriers and controls.

The colorbar represents the magnitude of the T scores (white: black, higher: lower). The T values are unthresholded. HD, Huntington’s disease

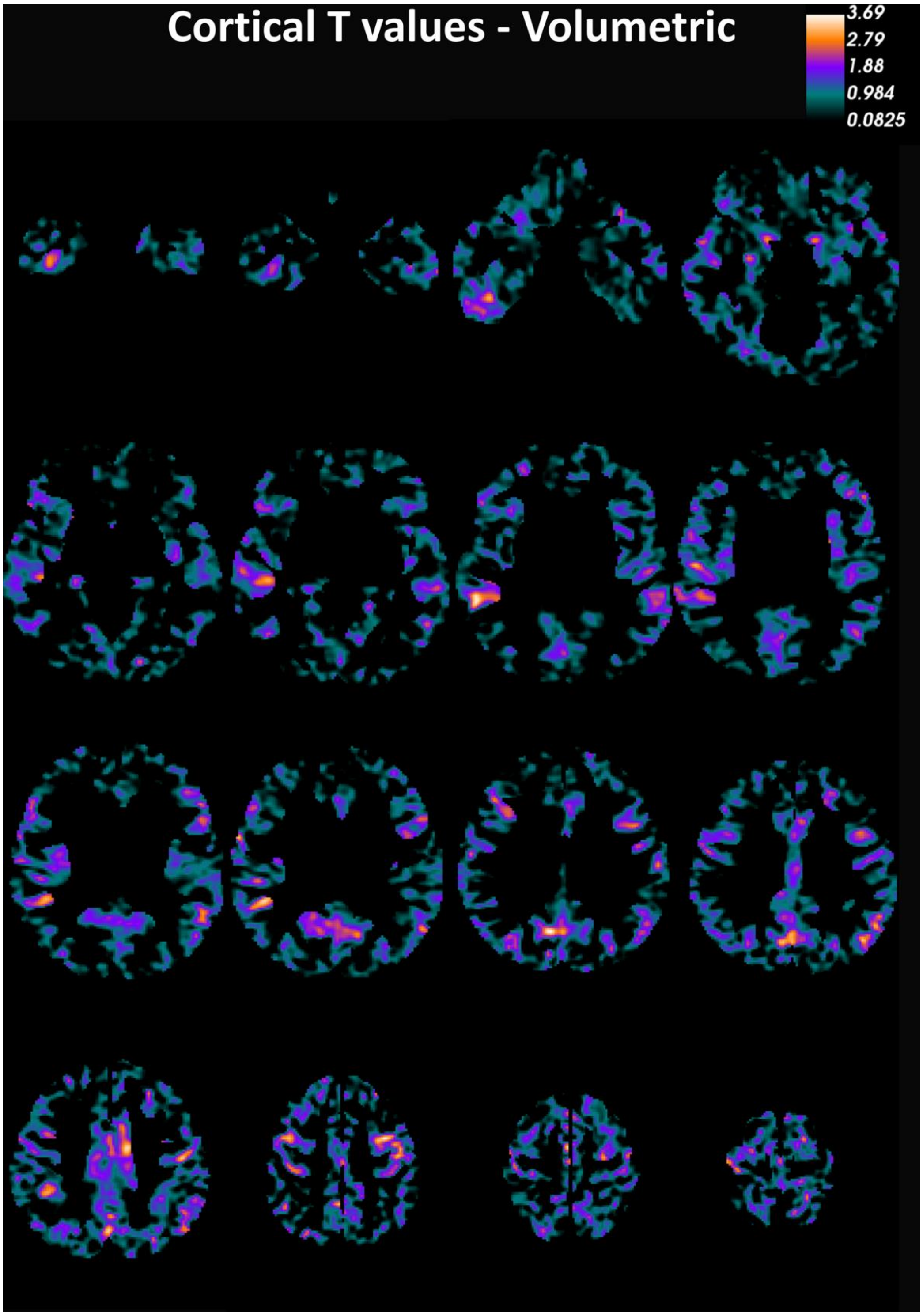

**Figure 2 Map depicting the cortical T values obtained from the mean diffusivity analysis comparing HD expansion carriers and controls.**

The colorbar represents the magnitude of the T scores (white: black, higher: lower). The T values are unthresholded. HD, Huntington's disease

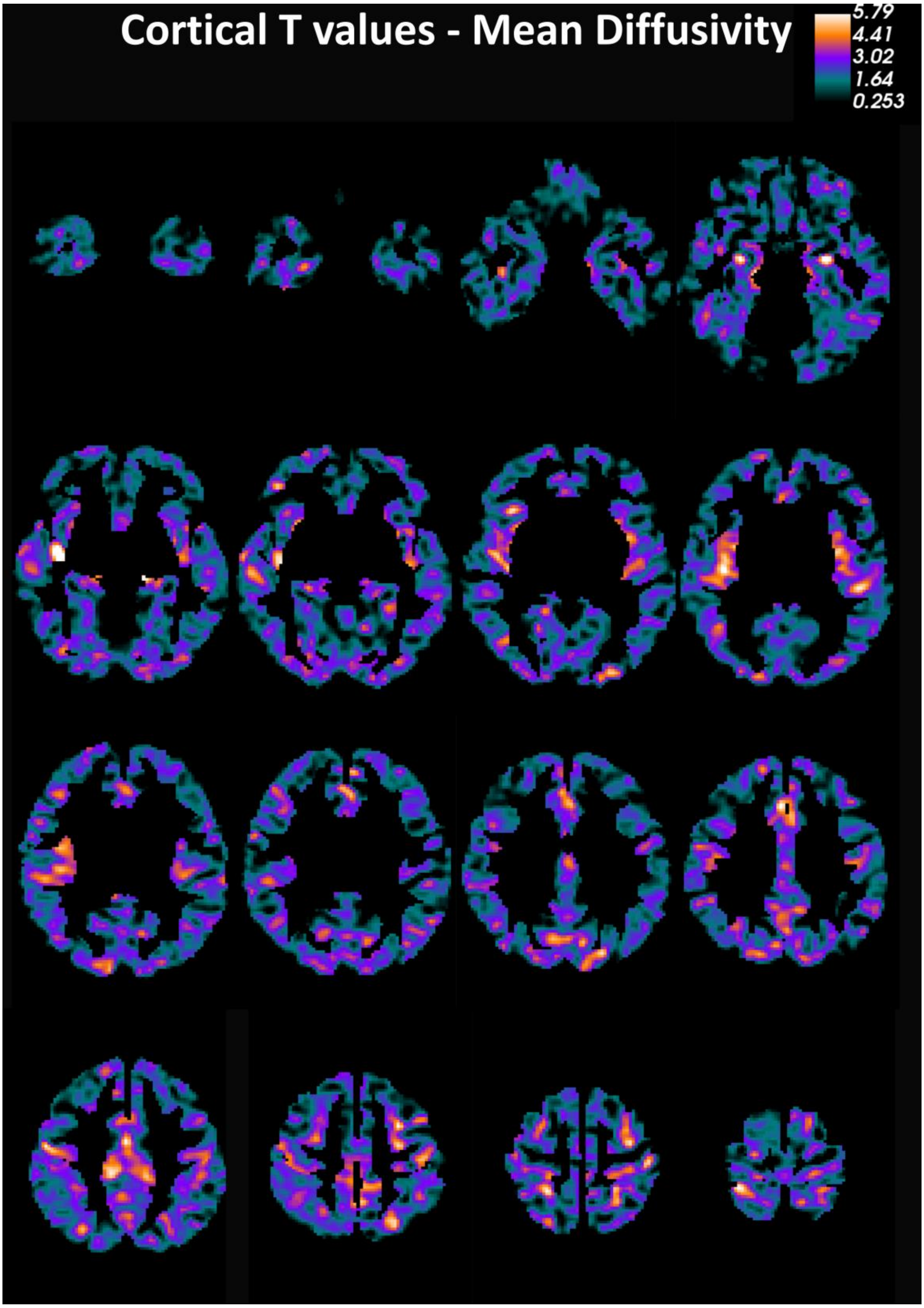
Cortical T values - Mean Diffusivity
5.79
4.41
3.02
1.64
0.253

**Figure 3 Density plots illustrating the distribution of T values from the volumetric (left) and mean diffusivity (right) analyses comparing HD expansion carriers and controls**

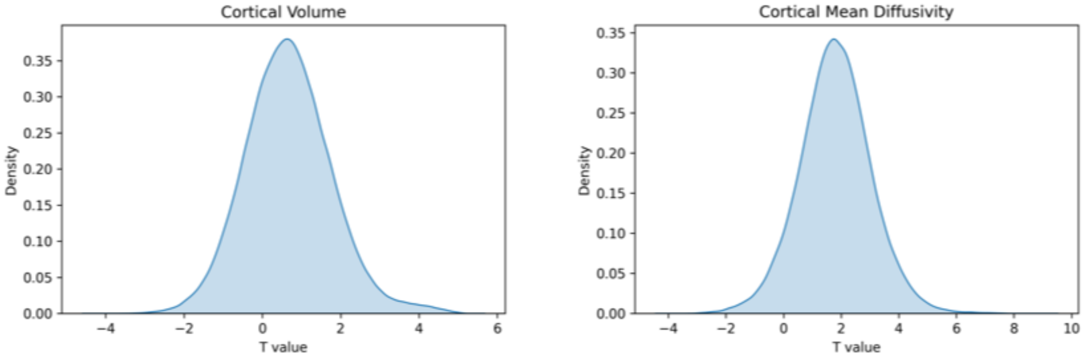

**Figure 4 Summary of the analysis between HTT expression and developmental genes**

A set of ten genes known to be differentially expressed during early cortical development was obtained from Kang et al. (Nature, 2011). The gene expression data for *HTT* and developmental genes was extracted from the AHBA across 110 regions of interest (ROIs), including cortical, subcortical (Desikan), and cerebellar (Diedrichsen) regions, using the abagen toolbox.

A principal component analysis was performed in the expression of developmental genes across ROIs. The first principal component was correlated with the expression of *HTT* across ROIs. Significance was determined using the P-spin test and through bootstrapping.

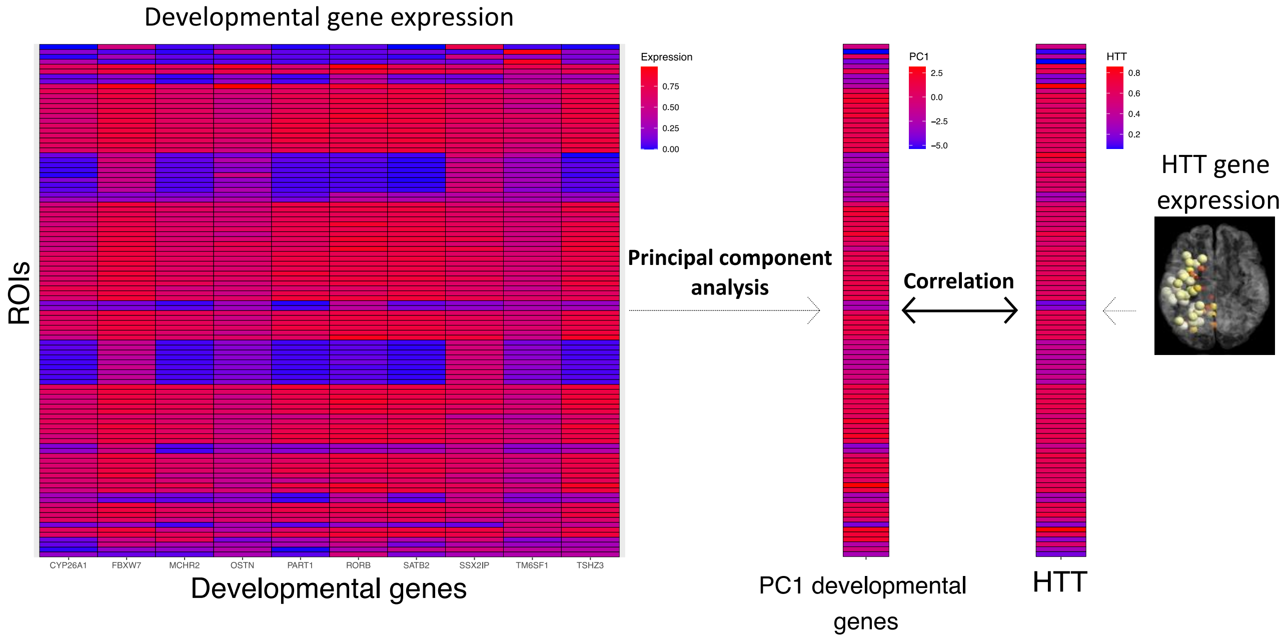

**Table 1 Top 10% genes positively associated with cortical volume**

| Gene | T |
|---|---|
| GLI1 | 3.88580107 |
| HIST1H3H | 3.39847815 |
| FMO2 | 3.26389359 |
| ITGA11 | 3.2124481 |
| BGN | 3.15524776 |
| PTGER1 | 3.0864971 |
| SNAI2 | 3.0674731 |
| ID3 | 2.9616936 |
| ACO1 | 2.95740139 |
| PMAIP1 | 2.91425275 |
| GINS2 | 2.90816321 |
| PECAM1 | 2.89622113 |
| NPY2R | 2.88353433 |
| VASH2 | 2.88066286 |
| TRPS1 | 2.85790295 |
| TRAF3IP2 | 2.84642471 |
| BMP6 | 2.8111231 |
| PPP1R3B | 2.8037253 |
| TM4SF18 | 2.76617085 |
| CXCR4 | 2.6840766 |
| FAM117A | 2.68270284 |
| GPR182 | 2.68246512 |
| CDH23 | 2.60900539 |
| PDLIM4 | 2.59084608 |
| NFIA | 2.58738402 |
| HAP1 | 2.57256284 |
| TIMP3 | 2.56715779 |
| APOLD1 | 2.56564361 |
| PERP | 2.56535708 |
| PLOD2 | 2.54054722 |
| FOXC2 | 2.53534146 |
| NRN1L | 2.53463101 |
| NUP188 | 2.52810064 |
| CYYR1 | 2.49024649 |
| ME1 | 2.48732351 |
| THBS4 | 2.46920629 |
| PTGES | 2.45477841 |
| FOXO1 | 2.44808126 |
| VANGL1 | 2.44791166 |
| GBE1 | 2.43408656 |

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|---|---|
| PLEKHA7 | 2.40271812 |
| THSD4 | 2.39768845 |
| TMEM215 | 2.36333168 |
| MATN3 | 2.34909877 |
| GPR39 | 2.34649896 |
| IL7R | 2.33829496 |
| C22orf15 | 2.33495334 |
| FAM181A | 2.33470644 |
| HDAC7 | 2.33457572 |
| SLC39A8 | 2.32911191 |
| GALR3 | 2.32722194 |
| PARP10 | 2.32363115 |
| NINL | 2.31362078 |
| KLHL1 | 2.29934257 |
| TRIL | 2.29901214 |
| GABRE | 2.28803047 |
| AVPR2 | 2.2774752 |
| VANGL2 | 2.27520983 |
| RAB33B | 2.26582196 |
| CCDC6 | 2.26446436 |
| PDE11A | 2.26005054 |
| ITGA6 | 2.25996385 |
| EPB41L4A | 2.25142763 |
| PELI2 | 2.24852174 |
| ZNRF3 | 2.24634436 |
| SPATA18 | 2.2391544 |
| LAPTM4A | 2.2323171 |
| DNAH12 | 2.22917396 |
| COMP | 2.22650656 |
| GLUL | 2.21962672 |
| HPR | 2.21754523 |
| HLA-G | 2.21524752 |
| AQP5 | 2.21524528 |
| RAET1K | 2.20745743 |
| ZSCAN1 | 2.20187657 |
| CRB1 | 2.19903604 |
| SYPL2 | 2.1890825 |
| TUBB2B | 2.18555866 |
| AIRE | 2.18352414 |
| CDSN | 2.18257181 |
| TBX19 | 2.17964303 |
| ZIC3 | 2.15402555 |
| OR5B17 | 2.1479751 |

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|---|---|
| TIE1 | 2.14376036 |
| ACR | 2.14094043 |
| AEBP1 | 2.1378673 |
| LFNG | 2.13534109 |
| KLHL13 | 2.13392929 |
| MGST2 | 2.12516246 |
| LYPD2 | 2.12487237 |
| IRGC | 2.12149359 |
| CTGF | 2.1194305 |
| PLAGL2 | 2.11313983 |
| C11orf16 | 2.11184703 |
| EPCAM | 2.11009803 |
| SLC7A10 | 2.10443007 |
| PPP1R13L | 2.09981952 |
| USP49 | 2.09704019 |
| MYCT1 | 2.0938603 |
| CA5A | 2.08752301 |
| S1PR1 | 2.08723955 |
| HMGCR | 2.08572608 |
| SYDE1 | 2.08414121 |
| S100A4 | 2.07207849 |
| PRKCH | 2.0707388 |
| GPR4 | 2.06958381 |
| PXDN | 2.06945497 |
| SLC26A2 | 2.06704051 |
| CDR1 | 2.06370601 |
| LOXL1 | 2.06170005 |
| PIRT | 2.05539544 |
| LRRTM2 | 2.05428883 |
| PPIC | 2.05116533 |
| TP53INP1 | 2.0510653 |
| ITGA9 | 2.0496379 |
| PPBP | 2.04459272 |
| MYOD1 | 2.039352 |
| GBP2 | 2.0369293 |
| GPBAR1 | 2.0355497 |
| LRIG1 | 2.03257702 |
| IGFN1 | 2.03002517 |
| HSD3B7 | 2.02507047 |
| SYNPR | 2.02207339 |
| ITGA1 | 2.02168711 |
| MICA | 2.01996738 |
| EDN3 | 2.01933677 |

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|---|---|
| PLSCR4 | 2.01908473 |
| WT1-AS | 2.01650593 |
| ERG | 2.01373598 |
| SLITRK6 | 2.00843479 |
| FSTL5 | 2.00424786 |
| MED25 | 1.99920916 |
| LAG3 | 1.99844612 |
| MYH11 | 1.99543516 |
| OR52W1 | 1.99371016 |
| TMED10P1 | 1.99076191 |
| TTC36 | 1.989561 |
| WFDC12 | 1.98945955 |
| CXCR3 | 1.98889918 |
| MYEOV | 1.98858878 |
| ITGB4 | 1.98852782 |
| PGAM2 | 1.98569344 |
| SMO | 1.9849048 |
| BHMT2 | 1.98199314 |
| SLC38A5 | 1.97819895 |
| C1orf226 | 1.9754995 |
| CLDN14 | 1.97491332 |
| FKBP10 | 1.97447818 |
| SLC38A2 | 1.9712322 |
| SNX33 | 1.96977071 |
| CBR3 | 1.968428 |
| HTRA3 | 1.9622445 |
| SLC2A10 | 1.96092165 |
| SLC22A31 | 1.9606276 |
| KCNK7 | 1.95134379 |
| TGIF1 | 1.94696713 |
| LALBA | 1.94615627 |
| CRB3 | 1.94567124 |
| PRRX2 | 1.93776174 |
| ZSCAN22 | 1.93619924 |
| ITGA7 | 1.93452595 |
| N4BP2 | 1.93329367 |
| AMN | 1.93208044 |
| SLC25A20 | 1.92966746 |
| RCOR2 | 1.92959624 |
| MLPH | 1.92555451 |
| PRX | 1.92260883 |
| NCF4 | 1.92069507 |
| LRRN1 | 1.91780997 |

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|---|---|
| FAM201A | 1.91631036 |
| GRP | 1.91629273 |
| TRIM71 | 1.91563104 |
| TTPA | 1.9148975 |
| PBXIP1 | 1.91311339 |
| NPW | 1.90461061 |
| SRPX | 1.90275115 |
| CCT5 | 1.89907087 |
| GPR153 | 1.89691028 |
| CGNL1 | 1.89243495 |
| INSIG1 | 1.89230976 |
| BTN3A3 | 1.89188584 |
| SPRR1A | 1.88850588 |
| IFIH1 | 1.88160627 |
| NXNL2 | 1.8781233 |
| LOC441204 | 1.87797139 |
| HEYL | 1.87634381 |
| SSX5 | 1.87445228 |
| FOXD3 | 1.87444365 |
| IFIT3 | 1.87253933 |
| SLC4A4 | 1.86856036 |
| MTTP | 1.8654234 |
| PLCB4 | 1.86458691 |
| CPEB3 | 1.86364234 |
| SERPINH1 | 1.85981342 |
| CHST7 | 1.85969983 |
| RNF135 | 1.85549291 |
| DACT1 | 1.85351138 |
| MOV10 | 1.85298491 |
| PCMTD2 | 1.85168968 |
| KLHDC10 | 1.85168923 |
| SBF1P1 | 1.84874777 |
| NTSR2 | 1.84243373 |
| FBXO46 | 1.84215003 |
| C1QL2 | 1.84192103 |
| SLC22A5 | 1.84186478 |
| LRCH2 | 1.84163211 |
| RHOD | 1.84162936 |
| WFDC8 | 1.83974795 |
| LCA5 | 1.83785919 |
| EVX1 | 1.83775372 |
| BMP1 | 1.83398955 |
| PTN | 1.8339746 |

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|---|---|
| TMEM40 | 1.83224115 |
| MCM3AP-AS1 | 1.83061237 |
| MSLN | 1.82992813 |
| CPVL | 1.82970201 |
| HLA-F | 1.8260819 |
| SPINK8 | 1.82356548 |
| ZNF843 | 1.82270366 |
| MMP14 | 1.82212925 |
| CTF1 | 1.82144408 |
| CASKIN1 | 1.82090236 |
| CDH6 | 1.8198467 |
| HIST1H3B | 1.81869053 |
| TMEM72 | 1.81774457 |
| IGFBP7 | 1.81635135 |
| DERA | 1.81564731 |
| ANXA1 | 1.81523378 |
| CRCT1 | 1.81266626 |
| PRRX1 | 1.81246481 |
| DHH | 1.81097889 |
| OR5H1 | 1.80819897 |
| GBP3 | 1.80611047 |
| CARD10 | 1.80469638 |
| GP9 | 1.80388743 |
| BEST3 | 1.79956138 |
| HOXA3 | 1.79872925 |
| PTH2 | 1.79671494 |
| FAM84B | 1.79617956 |
| PI3 | 1.79603274 |
| PAX8 | 1.7928923 |
| ADORA2B | 1.79281805 |
| HS3ST5 | 1.79223807 |
| NFIB | 1.79189092 |
| PLEKHA4 | 1.78957282 |
| APLNR | 1.78876088 |
| PDGFC | 1.78790743 |
| ALS2CL | 1.78670707 |
| RBPMS2 | 1.78570878 |
| IDH1 | 1.78522671 |
| LGR6 | 1.78349776 |
| TPSG1 | 1.78180475 |
| SMCR8 | 1.77912863 |
| IGF2BP2 | 1.77893752 |

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|---|---|
| SP7 | 1.77776256 |
| FGR | 1.77553796 |
| GCLM | 1.77456628 |
| COL7A1 | 1.77431829 |
| MXRA8 | 1.77112888 |
| PBX4 | 1.76874206 |
| PHYHD1 | 1.76744834 |
| SLC9A9 | 1.76686527 |
| PMEPA1 | 1.76633549 |
| SOX18 | 1.76608965 |
| HPDL | 1.76507558 |
| ANP32E | 1.76238433 |
| NHSL1 | 1.76160322 |
| TERT | 1.75999271 |
| IVL | 1.7597108 |
| KRTAP12-1 | 1.75824315 |
| TMEM88B | 1.75813577 |
| THSD1 | 1.75763209 |
| SALL2 | 1.75658035 |
| ZBED4 | 1.75652844 |
| EPHX2 | 1.75457998 |
| PCSK9 | 1.75353906 |
| TNC | 1.75104736 |
| ADAMTS2 | 1.74897918 |
| ALAS2 | 1.74616793 |
| PLBD1 | 1.74533932 |
| KIF26A | 1.7414113 |
| SOX8 | 1.74104118 |
| ODF3L1 | 1.74003394 |
| TAS2R39 | 1.73940922 |
| PRKX | 1.73888121 |
| LCE1F | 1.7385824 |
| ENTPD2 | 1.7384396 |
| ADCY4 | 1.73815302 |
| EFCAB6 | 1.73751852 |
| SCGB3A1 | 1.73696595 |
| OLFML2A | 1.73544255 |
| TFF3 | 1.73401257 |
| DCHS1 | 1.73128843 |
| MYD88 | 1.73027822 |
| GAB4 | 1.72603352 |
| SRP72 | 1.72551573 |
| PDGFRB | 1.72391867 |

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|---|---|
| MAP3K2 | 1.72386049 |
| MGAT4C | 1.72215846 |
| FAM129B | 1.71991754 |
| LRRC17 | 1.71968286 |
| CXCL2 | 1.71898237 |
| IFI27 | 1.71865916 |
| TES | 1.71855303 |
| MICALL1 | 1.71763489 |
| FAM43A | 1.716894 |
| KLK2 | 1.71679224 |
| SLC16A8 | 1.71315884 |
| SLCO2A1 | 1.71263707 |
| ZNF274 | 1.71161213 |
| PRDM6 | 1.71127779 |
| KRTAP5-10 | 1.70945038 |
| ACAA2 | 1.70880965 |
| DDR2 | 1.70868924 |
| SLC44A2 | 1.70856686 |
| KDSR | 1.70801075 |
| GJB3 | 1.70782356 |
| ITM2C | 1.70757391 |
| ADARB2-AS1 | 1.70739892 |
| SASH1 | 1.70698142 |
| KRTAP20-2 | 1.70525861 |
| CEP170 | 1.70481233 |
| EIF3M | 1.70403822 |
| LYPD1 | 1.70193046 |
| RGR | 1.7018399 |
| CPNE3 | 1.70103748 |
| KRTAP10-9 | 1.70063113 |
| DKK4 | 1.6994777 |
| APOA1 | 1.69772392 |
| PON2 | 1.69397514 |
| FXN | 1.69334962 |
| LY9 | 1.69287641 |
| LINC00475 | 1.69251296 |
| ABCB1 | 1.6912022 |
| KCNJ16 | 1.68957346 |
| GRIK4 | 1.6886129 |
| MGC70870 | 1.68677068 |
| PLTP | 1.68590171 |
| GPR63 | 1.68539826 |

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|---|---|
| GNA13 | 1.68507464 |
| LCE3A | 1.68136641 |
| LAMB2 | 1.67917282 |
| OXER1 | 1.67760521 |
| SYCP2 | 1.67702123 |
| ARL4A | 1.67630127 |
| IRX4 | 1.67614539 |
| KCNIP2 | 1.67366191 |
| RBM43 | 1.67280252 |
| ITPRIP | 1.67038775 |
| GANAB | 1.67022886 |
| NEUROG1 | 1.6698939 |
| SLC7A5 | 1.66947425 |
| HLA-L | 1.6693273 |
| ATP4A | 1.66885171 |
| CRYL1 | 1.66799988 |
| FFAR1 | 1.66587188 |
| MRVI1 | 1.66581502 |
| TTN | 1.66292282 |
| RETN | 1.66254883 |
| NPTX1 | 1.6596038 |
| RGMB | 1.65358193 |
| HGF | 1.6528458 |
| HLA-DQB2 | 1.65280975 |
| PLA2G15 | 1.64993604 |
| ALS2CR12 | 1.64579507 |
| ATP7A | 1.64514238 |
| GLUD1 | 1.64414642 |
| TOP1P2 | 1.64284231 |
| GNG11 | 1.64132685 |
| NLRC3 | 1.64089089 |
| CADM2 | 1.64068866 |
| ARTN | 1.63945431 |
| PHF21B | 1.63862014 |
| C10orf99 | 1.63842157 |
| ACP5 | 1.63719851 |
| H6PD | 1.63498889 |
| GH2 | 1.63404681 |
| GPR157 | 1.63131855 |
| LHFPL5 | 1.63025548 |
| PTGIR | 1.62951425 |
| ARID4A | 1.62941849 |
| C6orf201 | 1.62897482 |

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|---|---|
| BTN3A2 | 1.62818115 |
| ACTA2 | 1.6276856 |
| HEG1 | 1.6275141 |
| TMEM100 | 1.62738181 |
| HSD17B7 | 1.6270911 |
| OTX1 | 1.62699228 |
| MTMR9LP | 1.62662158 |
| KIAA1586 | 1.62649152 |
| TSPAN10 | 1.62643847 |
| ATP2C2 | 1.62475436 |
| PALMD | 1.62446382 |
| PTGR1 | 1.62443512 |
| ACTL6A | 1.62307494 |
| COL18A1 | 1.62302814 |
| ABCG2 | 1.62301659 |
| ATG4A | 1.62199 |
| POLE2 | 1.61943394 |
| CLASP1 | 1.61769914 |
| DNAH2 | 1.61549543 |
| ADAD2 | 1.61544047 |
| PIGA | 1.61536315 |
| SPIN4 | 1.61518957 |
| MED17 | 1.61498737 |
| SECTM1 | 1.61429387 |
| PHOX2A | 1.61401249 |
| PCOLCE | 1.61293905 |
| C16orf92 | 1.61290203 |
| PIPOX | 1.61253823 |
| ATP8B3 | 1.61181064 |
| ADAMTS9 | 1.61168329 |
| GNB3 | 1.61137177 |
| CYTL1 | 1.60979194 |
| KISS1 | 1.60852537 |
| PTPN18 | 1.60849145 |
| GOLIM4 | 1.60768604 |
| SBK2 | 1.60747361 |
| CYP11A1 | 1.60599238 |
| ANTXR2 | 1.60588241 |
| GDPD2 | 1.60465658 |
| IRF2 | 1.60344927 |
| ANKRD18A | 1.60040368 |
| LMAN1L | 1.5999479 |
| TMBIM4 | 1.59958959 |

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|---|---|
| ANKRD33 | 1.59871304 |
| SDK1 | 1.59592171 |
| TUBA3C | 1.5946917 |
| F2R | 1.59421627 |
| GLCCI1 | 1.59367367 |
| KRTAP12-4 | 1.59317274 |
| SLC12A4 | 1.59297899 |
| PHLPP1 | 1.59286169 |
| DDX58 | 1.59237458 |
| COL16A1 | 1.59217361 |
| ABCB7 | 1.59207904 |
| ACP6 | 1.58969156 |
| CNR1 | 1.58926709 |
| EPHA8 | 1.58861088 |
| UCN2 | 1.58826416 |
| IFITM5 | 1.58780211 |
| DMGDH | 1.58773131 |
| PSORS1C2 | 1.58649099 |
| NXF3 | 1.58522662 |
| DPT | 1.58202726 |
| AR | 1.58132742 |
| CD44 | 1.58093265 |
| PLAC8L1 | 1.58075863 |
| Mar-03 | 1.57925391 |
| MYCN | 1.57880575 |
| CPAMD8 | 1.57874355 |
| KRTAP5-11 | 1.57794051 |
| NFATC1 | 1.57728216 |
| TMEM52 | 1.57716591 |
| SEMA4A | 1.57705037 |
| GOLPH3L | 1.57672781 |
| KRT19 | 1.57629223 |
| C5orf22 | 1.5758246 |
| SOX13 | 1.57540123 |
| HSPA1A | 1.57464874 |
| RNF152 | 1.57423979 |
| RYR1 | 1.57223851 |
| TBX5 | 1.57169997 |
| CLPS | 1.57010199 |
| ZG16B | 1.5698743 |
| ARL4D | 1.56914737 |
| ZMIZ1 | 1.56909268 |
| BAHD1 | 1.56702092 |

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|---|---|
| SOX4 | 1.56575696 |
| ADPGK | 1.5656415 |
| NKX2-6 | 1.56508377 |
| USP37 | 1.56454582 |
| ITM2A | 1.56152957 |
| THUMPD1 | 1.56086404 |
| PLG | 1.55965357 |
| COL1A2 | 1.55944845 |
| EDNRB | 1.55835177 |
| ITM2B | 1.55772622 |
| EMCN | 1.55653596 |
| FOXL2 | 1.55651903 |
| CC2D2A | 1.5540975 |
| SOX17 | 1.55309245 |
| SLC7A11 | 1.55273932 |
| SEMA3A | 1.55194612 |
| AMZ1 | 1.54989127 |
| MT1L | 1.54918778 |
| AQP6 | 1.54907058 |
| FOXC1 | 1.54895195 |
| SFT2D3 | 1.54882637 |
| DCST2 | 1.54838844 |
| S1PR4 | 1.54726579 |
| SPRYD4 | 1.54700818 |
| KRTAP10-5 | 1.54664758 |
| DLK2 | 1.54539967 |
| ITPR3 | 1.54352031 |
| FBLN2 | 1.54178314 |
| STAG2 | 1.54013606 |
| KRTAP8-1 | 1.5401033 |
| UPK3A | 1.53998619 |
| GOLGA8A | 1.53934894 |
| BEND7 | 1.53900115 |
| MAP2K3 | 1.5384765 |
| NET1 | 1.53829639 |
| ZAN | 1.53599658 |
| MSX1 | 1.5350488 |
| CLDN5 | 1.53384251 |
| SGK494 | 1.53360399 |
| OR5V1 | 1.53276612 |
| SYNPO2L | 1.53265263 |
| DBI | 1.53215332 |
| CXCL14 | 1.53171232 |

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|---|---|
| CRYBB3 | 1.53157725 |
| A4GALT | 1.53114951 |
| GKN1 | 1.53003677 |
| ZBTB12 | 1.52999848 |
| GPR25 | 1.52988752 |
| MAOA | 1.52726369 |
| KDM5B | 1.52570545 |
| FGF3 | 1.52553302 |
| CSRP2 | 1.52517202 |
| THBS1 | 1.52484008 |
| A2M | 1.52472133 |
| TBCCD1 | 1.52471024 |
| PEX11A | 1.52462312 |
| COL6A3 | 1.52359249 |
| GIMAP7 | 1.52287353 |
| ZNF208 | 1.52273424 |
| ECSCR | 1.52265934 |
| SQLE | 1.521965 |
| KRTAP6-1 | 1.52075795 |
| DNMBP | 1.5203733 |
| GNRH2 | 1.51873967 |
| SOD3 | 1.51834972 |
| CLCN1 | 1.5167321 |
| ZNF596 | 1.51623327 |
| NFRKB | 1.51608616 |
| IER5 | 1.51602392 |
| REM2 | 1.51563842 |
| BMPR2 | 1.51538243 |
| PDE6G | 1.51494807 |
| PLVAP | 1.51412229 |
| ABCB6 | 1.5134354 |
| FEM1A | 1.51343174 |
| CAMK2G | 1.51329943 |
| CDH16 | 1.51324896 |
| SCRT2 | 1.51297481 |
| ZNF784 | 1.51133595 |
| SERINC1 | 1.51128986 |
| LIX1 | 1.51065595 |
| BTNL2 | 1.50948568 |
| ART3 | 1.5055337 |
| DCAF12L2 | 1.50375826 |
| NXT2 | 1.50370623 |
| KLF15 | 1.50309133 |

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| KRTAP10-3 | 1.50282828 |
| UG0898H09 | 1.50274304 |
| AQP2 | 1.50269611 |
| KRTAP19-1 | 1.50268799 |
| LOC728024 | 1.50224944 |
| HES5 | 1.50140092 |
| FAM83E | 1.50094254 |
| HSD11B1 | 1.49971704 |
| GPR37L1 | 1.49870052 |
| RASL12 | 1.49675874 |
| SPRR2C | 1.4966677 |
| AGT | 1.49651257 |
| RPS6KA6 | 1.49574661 |
| SLC1A3 | 1.495367 |
| DEFB115 | 1.49168366 |
| MT1B | 1.49158473 |
| SENP6 | 1.49126278 |
| P2RX3 | 1.49019498 |
| OR1E1 | 1.48997699 |
| RAB34 | 1.48955151 |
| TCF15 | 1.48899978 |
| KDM5A | 1.4887226 |
| ID4 | 1.48859161 |
| COX6B2 | 1.48836381 |
| KRTAP21-1 | 1.48780274 |
| EIF3IP1 | 1.48745866 |
| NAGS | 1.48661299 |
| PTCD3 | 1.48565866 |
| LINC00304 | 1.48262356 |
| NCAPG2 | 1.48262017 |
| NEK8 | 1.48256889 |
| KRTAP2-1 | 1.481509 |
| GPAM | 1.48123907 |
| RTN4RL2 | 1.48095916 |
| VAX2 | 1.48092235 |
| SLC44A3 | 1.48056822 |
| WNT11 | 1.47985091 |
| ISM2 | 1.47783488 |
| ARSK | 1.47703213 |
| ISLR2 | 1.475702 |
| ZC3HAV1L | 1.47368698 |
| MYL3 | 1.47332286 |
| ZSWIM5 | 1.47287257 |

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| MYOG | 1.47242601 |
| ZFP36L2 | 1.47191025 |
| CKMT2 | 1.47097046 |
| CAV1 | 1.46995112 |
| SLC2A4RG | 1.46960535 |
| DARS | 1.46957289 |
| PDYN | 1.46909135 |
| FAM47C | 1.46776796 |
| CD81 | 1.46748698 |
| ACTG2 | 1.46715824 |
| CD27 | 1.46703987 |
| TRIM49 | 1.46556306 |
| GTF3C4 | 1.46549248 |
| TMEM30B | 1.46429631 |
| OR10H2 | 1.46074202 |
| TMEM150A | 1.46071478 |
| MAMSTR | 1.46025823 |
| BMP2 | 1.45984885 |
| SERPINE2 | 1.4594558 |
| REC8 | 1.45934062 |
| GSTM3 | 1.45855166 |
| DGKG | 1.45854496 |
| MUC2 | 1.45820001 |
| SHANK2-AS3 | 1.45722475 |
| SPNS3 | 1.45616948 |
| KRTAP5-3 | 1.45614901 |
| FGFRL1 | 1.45521095 |
| SLC1A2 | 1.45516571 |
| KCNIP1 | 1.45373429 |
| ZNF648 | 1.45346237 |
| KBTBD6 | 1.45320318 |
| CCR3 | 1.45211803 |
| MYADML | 1.45205326 |
| BARX1 | 1.45152948 |
| GNLY | 1.45115748 |
| ZNF229 | 1.44912347 |
| NPC2 | 1.44718734 |
| TTC38 | 1.44649467 |
| ELN | 1.44643263 |
| GEM | 1.44561553 |
| BTBD17 | 1.44530524 |
| EIF2AK3 | 1.44435164 |

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| LAMA1 | 1.44340171 |
| CD109 | 1.44322798 |
| MMP9 | 1.44302021 |
| GPR152 | 1.44246749 |
| ASAP3 | 1.44229748 |
| PPP1R1A | 1.44192169 |
| CHST14 | 1.44097037 |
| MT1X | 1.44090391 |
| BCL11B | 1.4402234 |
| RBM12 | 1.439246 |
| CDK4 | 1.43820658 |
| GCK | 1.43780099 |
| KRTAP20-1 | 1.43604044 |
| HPSE2 | 1.43517207 |
| DNMT3B | 1.43455793 |
| SLFN11 | 1.43443476 |
| ST7-AS1 | 1.43440608 |
| STK33 | 1.43394678 |
| RRN3 | 1.43385748 |
| ZFHX4 | 1.43380117 |
| BLCAP | 1.43369846 |
| PDCD5 | 1.43322291 |
| EFNB1 | 1.43307396 |
| PDLIM5 | 1.43302106 |
| ULBP1 | 1.43143349 |
| PDP1 | 1.43056733 |
| SCG2 | 1.42923835 |
| LY6G5C | 1.42803728 |
| LEPROT | 1.42635517 |
| FAM167A | 1.42558407 |
| XCR1 | 1.42501923 |
| CALCA | 1.42424975 |
| NLRC5 | 1.42185501 |
| IRX3 | 1.42181264 |
| LMO2 | 1.42169888 |
| CCR9 | 1.42110144 |
| BNIPL | 1.41907105 |
| PPARA | 1.41836638 |
| NPAS3 | 1.4170174 |
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| LCE2D | 1.41622794 |
| BIRC3 | 1.4160589 |
| OR2Z1 | 1.41590257 |

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| TNFRSF12A | 1.41486989 |
| PLRG1 | 1.41483204 |
| ITGAV | 1.41455424 |
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**Table 2 Top 10% genes negatively associated with cortical volume**

| Gene | T |
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| PPM1L | -3.29551384 |
| GRB14 | -3.24792976 |
| COL10A1 | -3.10444295 |
| FAM162B | -3.08467349 |
| NELL1 | -2.87059658 |
| AMACR | -2.8461087 |
| BAIAP2L2 | -2.74602815 |
| PKD2L1 | -2.66747213 |
| CDK5R1 | -2.64009071 |
| COL5A2 | -2.62711306 |
| MRPS30 | -2.61976925 |
| KRT83 | -2.61765496 |
| C1QA | -2.58965417 |
| SCN8A | -2.4975413 |
| RPS19BP1 | -2.48523945 |
| LRRC6 | -2.48327837 |
| NUDT14 | -2.48013273 |
| LCN15 | -2.47661674 |
| PTTG1 | -2.4711451 |
| ZNF717 | -2.46440991 |
| SLC36A1 | -2.44312456 |
| TTR | -2.41185023 |
| FAM49A | -2.39116565 |
| FAM182B | -2.37808979 |
| TMEM65 | -2.36718555 |
| RPS24 | -2.34676723 |
| CDT1 | -2.34534546 |
| COL19A1 | -2.34274626 |
| PHLDA2 | -2.32332855 |
| CAMK4 | -2.32054714 |
| UST | -2.30227162 |
| NOV | -2.30002486 |
| COL24A1 | -2.29010284 |
| ZNRF2 | -2.27623914 |
| TRAPPC1 | -2.27431928 |
| RASGRF1 | -2.26516357 |
| C1QB | -2.26257398 |
| ISG15 | -2.25266104 |
| DBNDD1 | -2.24294098 |
| SHROOM3 | -2.23809376 |

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| RARB | -2.23261251 |
| PTTG2 | -2.21600345 |
| SLC2A5 | -2.21341536 |
| FGF17 | -2.21244588 |
| TYROBP | -2.18208791 |
| RDH12 | -2.1791099 |
| ENTPD4 | -2.16246471 |
| SIGLEC14 | -2.15573022 |
| CRYBB2P1 | -2.14569079 |
| PPIAL4G | -2.13165139 |
| CARTPT | -2.12139593 |
| SAMD14 | -2.11295936 |
| RPS21 | -2.11199667 |
| OLFM3 | -2.10999371 |
| GABRB2 | -2.10507687 |
| USE1 | -2.10166197 |
| FSD1 | -2.09275093 |
| RAB27B | -2.09073084 |
| ASGR2 | -2.08951546 |
| FAM78B | -2.08617787 |
| TPK1 | -2.06964817 |
| KCNH5 | -2.06767649 |
| CCDC148 | -2.06372555 |
| TRAF3IP3 | -2.0560192 |
| RAB11FIP5 | -2.05412997 |
| PPL | -2.04210485 |
| PPEF1 | -2.04191896 |
| GRIN2B | -2.04008312 |
| TM6SF1 | -2.03647626 |
| SPTSSB | -2.03392426 |
| MET | -2.03185339 |
| HSPB3 | -2.03086187 |
| MAP3K12 | -2.02995551 |
| TMEM191A | -2.02776914 |
| HOXB3 | -2.0275512 |
| FAM20A | -2.02594076 |
| RASSF7 | -2.02395222 |
| ADCY8 | -2.0126444 |
| FAM185A | -2.00741713 |
| LRRC39 | -2.00586937 |
| CX3CR1 | -2.00518815 |
| DCBLD1 | -2.00410412 |
| BDKRB2 | -2.00118939 |

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| MARCH11 | -2.00052194 |
| NXPH2 | -1.99805764 |
| RPS29 | -1.99228617 |
| CSF2RA | -1.98956576 |
| TMEM141 | -1.98013952 |
| STAT4 | -1.97783456 |
| ZRANB3 | -1.97349053 |
| EXOSC1 | -1.97077992 |
| CAMK2D | -1.96893501 |
| NAPSB | -1.96872454 |
| POLD4 | -1.96528072 |
| PCDHB2 | -1.96181663 |
| PELI3 | -1.95685049 |
| SIDT1 | -1.94582477 |
| ARHGAP26 | -1.94472913 |
| OSTF1 | -1.94464034 |
| EPHA6 | -1.93770694 |
| ARHGDIG | -1.93619088 |
| DPYSL4 | -1.93095422 |
| SATL1 | -1.93059377 |
| NTNG1 | -1.92757207 |
| ROGDI | -1.92653834 |
| ADCY1 | -1.92580833 |
| CBX4 | -1.92409886 |
| INO80E | -1.92142354 |
| NIPA1 | -1.9201265 |
| ASIP | -1.91337926 |
| WFDC2 | -1.90604248 |
| TLN2 | -1.90383831 |
| NT5DC3 | -1.90052122 |
| FAR2 | -1.90020631 |
| TRPV3 | -1.89786404 |
| NEUROD6 | -1.894338 |
| TMEM160 | -1.88957342 |
| ALKBH6 | -1.88692943 |
| SUSD3 | -1.88315649 |
| PAPSS2 | -1.88314614 |
| C11orf24 | -1.8817671 |
| COX4I2 | -1.88057265 |
| RAB15 | -1.87769944 |
| PAK1 | -1.87682644 |
| ZDHHC13 | -1.87678632 |
| ANAPC2 | -1.87128249 |

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| RPH3A | -1.87021013 |
| GTPBP10 | -1.86970167 |
| ARL15 | -1.86606592 |
| SERPINI1 | -1.86494774 |
| SPRN | -1.85648852 |
| GLMN | -1.8547508 |
| IP6K1 | -1.8504207 |
| SDR16C5 | -1.8496433 |
| BEND5 | -1.84923991 |
| SUSD5 | -1.84440547 |
| P2RY12 | -1.84215602 |
| ARMC7 | -1.83961509 |
| DLEU7 | -1.83900236 |
| SYCE1 | -1.83879436 |
| CDCA8 | -1.83381206 |
| OSBPL10 | -1.82763942 |
| POLR2I | -1.82597102 |
| PPP2R2C | -1.82394492 |
| ZBBX | -1.82336262 |
| SCAMP5 | -1.82232731 |
| NHP2 | -1.8198052 |
| GNPAT | -1.81953658 |
| PPP5C | -1.81761303 |
| TLL1 | -1.81652029 |
| THRB | -1.81253721 |
| WDR27 | -1.81157451 |
| MYO1B | -1.81035172 |
| GTF2I | -1.80858316 |
| KIF17 | -1.80695013 |
| PDK3 | -1.80634725 |
| NCAPH | -1.80380763 |
| KCNB1 | -1.80189332 |
| MRPS35 | -1.79908313 |
| NAA50 | -1.79326296 |
| ZMAT5 | -1.79318808 |
| BAD | -1.79312141 |
| SERP2 | -1.79015633 |
| KCNIP3 | -1.78871057 |
| CCDC122 | -1.78017023 |
| ME3 | -1.77957807 |
| STAP2 | -1.77643508 |
| IAH1 | -1.77292178 |
| LOC728743 | -1.77076688 |

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| PANX1 | -1.7702668 |
| MYO1F | -1.76887791 |
| C12orf10 | -1.76829405 |
| DYNLL2 | -1.76759947 |
| CCDC87 | -1.75937147 |
| MANSC1 | -1.75800472 |
| MAST1 | -1.75726859 |
| SSH2 | -1.75473085 |
| RAC3 | -1.75172203 |
| MRPL3 | -1.74811982 |
| AKTIP | -1.74695822 |
| UQCRQ | -1.74538468 |
| ZBTB17 | -1.74427873 |
| MTMR4 | -1.74397693 |
| VWC2L | -1.74373237 |
| CNTNAP5 | -1.74227974 |
| PPM1J | -1.74009158 |
| FAM98C | -1.7369151 |
| COBLL1 | -1.73660201 |
| TTBK2 | -1.73162366 |
| PTPN3 | -1.73058237 |
| COX8A | -1.72770805 |
| PGP | -1.72695732 |
| ALOX5AP | -1.72632147 |
| MYBPHL | -1.72426531 |
| NOP16 | -1.72338711 |
| GNG13 | -1.72154644 |
| CPLX1 | -1.72119896 |
| FREM3 | -1.72076672 |
| SGTB | -1.72010767 |
| HIST1H2BD | -1.71943975 |
| CHCHD5 | -1.71776132 |
| DPM2 | -1.71608888 |
| ETV6 | -1.71555692 |
| RHEBL1 | -1.71548615 |
| SERPINF1 | -1.71541803 |
| RASGEF1B | -1.71477209 |
| HSPBP1 | -1.71163782 |
| OR2L3 | -1.7072141 |
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| RGS18 | -1.7052355 |
| ADRA1D | -1.70493624 |
| NDUFV1 | -1.70486232 |

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| PRKG2 | -1.70477024 |
| USF1 | -1.69884828 |
| CTXN3 | -1.69819586 |
| GNG3 | -1.697092 |
| TRMT12 | -1.69563055 |
| NLE1 | -1.69231689 |
| GPR34 | -1.68515621 |
| DTX4 | -1.68259919 |
| RTN2 | -1.68229362 |
| TSC22D1 | -1.68100054 |
| APRT | -1.67911682 |
| KPNA5 | -1.67266441 |
| ARL9 | -1.66804141 |
| TMEM143 | -1.6671669 |
| IL26 | -1.66598806 |
| TIMM10 | -1.66335968 |
| KCNK12 | -1.66251224 |
| CHI3L1 | -1.66138147 |
| LAPTM5 | -1.66053026 |
| NPM2 | -1.65999766 |
| RRP9 | -1.65958536 |
| RGS10 | -1.65930112 |
| FDX1L | -1.65897028 |
| TGFBRAP1 | -1.6565792 |
| VSIG4 | -1.65553652 |
| RASAL3 | -1.65452795 |
| B3GAT1 | -1.6543154 |
| MATK | -1.65415352 |
| BRMS1 | -1.65130787 |
| ZNF711 | -1.65101206 |
| FBXW9 | -1.65064911 |
| CNTN5 | -1.64738696 |
| ADAMTS19 | -1.64678323 |
| TAF13 | -1.64565538 |
| POPDC3 | -1.64563969 |
| ERI2 | -1.64375409 |
| SATB1 | -1.64296657 |
| GOSR1 | -1.64243595 |
| ELOVL6 | -1.63895121 |
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| MRPL36 | -1.62804909 |
| PPP3R1 | -1.62665695 |
| PRKAR1B | -1.62576411 |

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| SORL1 | -1.61447731 |
| ACOT8 | -1.60557288 |
| FAM110A | -1.60306185 |
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| EIF2B2 | -1.5989508 |
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| UXS1 | -1.59532453 |
| TRAPPC9 | -1.59367696 |
| SMUG1 | -1.59326145 |
| XYLT1 | -1.59245677 |
| IQCJ | -1.59218387 |
| ZCWPW2 | -1.59161589 |
| RIMS1 | -1.59068913 |
| PPFIA3 | -1.5883477 |
| MYRIP | -1.58808524 |
| KCNV1 | -1.58709513 |
| OPN3 | -1.58244844 |
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| DENND1C | -1.57685707 |
| VPS25 | -1.57661496 |
| ZNF280A | -1.57527544 |
| DDT | -1.57502782 |
| HAMP | -1.57227061 |
| HDC | -1.57136563 |
| MRPS12 | -1.57128257 |
| TDRD7 | -1.57111983 |
| FAM69B | -1.56706976 |
| SYT16 | -1.56644618 |
| LPAR1 | -1.56533327 |
| RTN4IP1 | -1.56446135 |
| PRSS16 | -1.56388275 |
| SLC22A18 | -1.56323917 |
| ARNTL2 | -1.56275053 |
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| HS6ST3 | -1.56013551 |
| NUDT22 | -1.55986205 |
| UQCR11 | -1.55947587 |

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| C6orf62 | -1.55566885 |
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| PIN1 | -1.5533024 |
| ZNF385B | -1.55304847 |
| NSMCE2 | -1.55239157 |
| RPS27 | -1.55130831 |
| PIK3AP1 | -1.55060517 |
| PLCXD1 | -1.54957711 |
| PTPN4 | -1.54924003 |
| RPL36 | -1.54833418 |
| RAB3D | -1.5474649 |
| FAM173A | -1.54713725 |
| APP | -1.54562385 |
| KCNH1 | -1.54261929 |
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| MPG | -1.54190129 |
| PTPN21 | -1.54156676 |
| NUBP1 | -1.53755284 |
| ADAMTS5 | -1.53643754 |
| LY6G5B | -1.53327783 |
| CBX3 | -1.53326595 |
| L3MBTL3 | -1.5320461 |
| XRCC4 | -1.53032882 |
| COX7B | -1.52884761 |
| TEKT5 | -1.52819071 |
| TRMT61B | -1.52727235 |
| EML1 | -1.5255224 |
| PPM1M | -1.5225343 |
| AIF1 | -1.52190571 |
| DGKI | -1.52171939 |
| MIEN1 | -1.51932517 |
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| MAPK1 | -1.51781909 |
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| ZNF668 | -1.51304092 |
| ATG12 | -1.51101757 |

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| CPNE7 | -1.50563966 |
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| CCM2 | -1.50434504 |
| GFM1 | -1.50379199 |
| ELAVL4 | -1.50306129 |
| MOCS3 | -1.50297751 |
| ABHD5 | -1.50208074 |
| RELL2 | -1.50177789 |
| ARG2 | -1.50135024 |
| C11orf80 | -1.50052664 |
| MIPEP | -1.49928735 |
| WDR55 | -1.49915792 |
| FBXL15 | -1.49853594 |
| C12orf54 | -1.49835894 |
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| EXOSC4 | -1.49389461 |
| NDUFA13 | -1.4929828 |
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| TMEM232 | -1.4903588 |
| ZNF471 | -1.49010867 |
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| TNFRSF11A | -1.48844617 |
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| MPV17 | -1.48488031 |
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| RHOT1 | -1.48421283 |
| PMS2P1 | -1.48288297 |
| C12orf4 | -1.47912225 |
| ATP6V1G2 | -1.47859018 |
| STRBP | -1.47633993 |
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| TMEM11 | -1.47491739 |
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| C19orf70 | -1.47459956 |
| ACTN4 | -1.47300323 |
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| NT5DC2 | -1.4688075 |
| LAIR1 | -1.46074046 |
| CDH8 | -1.46050438 |
| MRPL18 | -1.46023479 |
| MPND | -1.45864129 |
| DDX49 | -1.45717424 |
| NICN1 | -1.45586049 |
| DNAJA2 | -1.45550315 |
| SMYD5 | -1.45548098 |
| SLC25A10 | -1.45509475 |
| DTWD2 | -1.45377742 |
| TBC1D30 | -1.45374954 |
| ZFYVE9 | -1.45308043 |
| SNX10 | -1.45169163 |
| SLC25A46 | -1.45133744 |
| DDX41 | -1.44980387 |
| REXO4 | -1.44961438 |
| TFPT | -1.4490748 |
| RGS7 | -1.44856472 |
| ST6GALNAC5 | -1.44813898 |
| GLIS1 | -1.4463153 |
| FRMD5 | -1.44371675 |
| GAS5 | -1.44304614 |
| WDR83OS | -1.44234287 |
| APBA1 | -1.44143248 |
| HIST1H4K | -1.44116945 |
| TMEM68 | -1.43951031 |
| ZSCAN23 | -1.43847777 |
| FAM89B | -1.43781374 |
| CD53 | -1.43748265 |
| SULT4A1 | -1.43613346 |
| SNRPE | -1.43580408 |
| TLR6 | -1.43553881 |
| EPHA3 | -1.43539492 |
| TPST2 | -1.43535645 |
| STX1A | -1.43523273 |
| TMOD2 | -1.43342664 |
| GPR183 | -1.43252823 |
| CA10 | -1.43221134 |

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|---|---|
| OXR1 | -1.4308572 |
| PTGES2 | -1.43072907 |
| FIG4 | -1.43068268 |
| DIS3L | -1.429308 |
| GGH | -1.42899879 |
| RANBP10 | -1.4289654 |
| PDZD4 | -1.42851117 |
| RPL23AP82 | -1.42776879 |
| ZNF780B | -1.42747627 |
| C3 | -1.42711816 |
| APBB1IP | -1.4269186 |
| KATNB1 | -1.42687961 |
| SLC35A4 | -1.42369452 |
| VASH1 | -1.42266904 |
| LOC731157 | -1.42229135 |
| ANAPC1 | -1.42188501 |
| RPE | -1.42188402 |
| GNB1 | -1.42154617 |
| SAMHD1 | -1.41750906 |
| ALKBH7 | -1.41625681 |
| C19orf47 | -1.41607586 |
| MAP2K2 | -1.41471505 |
| CDC6 | -1.41462192 |
| AAK1 | -1.41410543 |
| GRM5 | -1.4139411 |
| GDF10 | -1.41370265 |
| RNF170 | -1.41228334 |
| ELK4 | -1.41049183 |
| ITGA2B | -1.41002511 |
| MCM7 | -1.40946415 |
| POLR2E | -1.40918422 |
| NUDT6 | -1.40871784 |
| LMBRD2 | -1.4084675 |
| BTBD6 | -1.40746342 |
| ARL6 | -1.40550572 |
| DUSP3 | -1.40455813 |
| KCNB2 | -1.40455139 |
| MRPL21 | -1.40450605 |
| PHLDA3 | -1.40413036 |
| NDUFB7 | -1.40342138 |
| FGL2 | -1.40243685 |
| MAP2K6 | -1.40234515 |
| KHDRBS2 | -1.4010049 |

| | |
|---|---|
| TRMU | -1.40083603 |
| GRIN2A | -1.39955197 |
| ILVBL | -1.39919181 |
| NEDD8 | -1.39852502 |
| BARD1 | -1.39837608 |
| RANBP9 | -1.39830352 |
| LARP4B | -1.39699891 |
| RNF220 | -1.39675847 |
| FKBP3 | -1.39663574 |
| HRASLS | -1.39611847 |
| TTC23L | -1.39605044 |
| NDUFV3 | -1.39465396 |
| COPE | -1.39447713 |
| USP12 | -1.39435047 |
| VPS4A | -1.39330752 |
| S100Z | -1.39319066 |
| MAP4K2 | -1.39295858 |
| NKAIN2 | -1.39295423 |
| NTHL1 | -1.39235319 |
| GMPPB | -1.39042419 |
| HECW2 | -1.38985114 |
| TRPM4 | -1.3891795 |
| SLC44A5 | -1.38833604 |
| RAD9A | -1.38819692 |
| COASY | -1.38754509 |
| HIST1H4J | -1.38734865 |
| VCPIP1 | -1.38641521 |
| FIBP | -1.38630053 |
| HDAC5 | -1.38547611 |
| TRNP1 | -1.38486767 |
| DUSP2 | -1.38430425 |
| VMO1 | -1.38407761 |
| CALM3 | -1.38323437 |
| DUSP6 | -1.38228081 |
| FCGR2A | -1.38098453 |
| S100A8 | -1.38076644 |
| SSNA1 | -1.37931261 |
| EHBP1L1 | -1.37900531 |
| CATSPER2P1 | -1.3788177 |
| DCXR | -1.37715011 |
| SLC38A6 | -1.37690977 |
| RPF2 | -1.3748986 |

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|---|---|
| PRDX5 | -1.37395876 |
| ALKBH2 | -1.37394421 |
| ADAM9 | -1.3722963 |
| C1orf162 | -1.37199545 |
| PTPRT | -1.37181549 |
| GABRA3 | -1.37098084 |
| CLEC2L | -1.37063986 |
| RPL10 | -1.36988081 |
| TNFSF13B | -1.36774365 |
| CEP152 | -1.36769686 |
| TSHZ3 | -1.36746462 |
| TMSB10 | -1.36725239 |
| MCHR2 | -1.36697644 |
| PARP6 | -1.3668965 |
| NOP14 | -1.36570628 |
| HOMER2 | -1.36491208 |
| CHRNA2 | -1.36416593 |
| CYP46A1 | -1.36357897 |
| SEMA7A | -1.36325439 |
| THAP7 | -1.3607321 |
| TTL | -1.36036444 |
| ZNF592 | -1.35995758 |
| VIPR2 | -1.35952712 |
| YTHDF3 | -1.35913548 |
| TFEC | -1.35875761 |
| WDR13 | -1.35653323 |
| MYO19 | -1.35529518 |
| RHCE | -1.35504648 |
| FBXW5 | -1.35438585 |
| ABHD8 | -1.3521005 |
| ZNF517 | -1.3519152 |
| SLC25A16 | -1.3509842 |
| RASGRF2 | -1.34837451 |
| HK2 | -1.34646657 |
| ANKRD52 | -1.34604879 |
| ZNHIT3 | -1.34538715 |
| KCNJ9 | -1.34499118 |
| MAL2 | -1.34350877 |
| B4GALT7 | -1.34264858 |
| PET100 | -1.34101818 |
| TMEM132C | -1.33855094 |
| XPO7 | -1.33828213 |
| ST3GAL3 | -1.33686377 |

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|---|---|
| FMN1 | -1.33675613 |
| GDA | -1.33637638 |
| ADAM23 | -1.33626413 |
| CBWD1 | -1.33618044 |
| FLOT1 | -1.33533631 |
| CNTNAP2 | -1.33524344 |
| VPS37D | -1.33377979 |
| HLA-DMB | -1.33370309 |
| ZNF526 | -1.33333045 |
| RASSF5 | -1.33168863 |
| VPS37A | -1.33161097 |
| MRPL14 | -1.33147444 |
| SUPT3H | -1.33034605 |
| NNT | -1.32941331 |
| ANKRD9 | -1.32934135 |
| TPI1P2 | -1.32804678 |
| RNF26 | -1.32789188 |
| SERINC5 | -1.32693837 |
| L3MBTL4 | -1.32607482 |
| GSS | -1.32483677 |
| EZH2 | -1.32378803 |
| SPHKAP | -1.32372012 |
| VMAC | -1.32294756 |
| RNF14 | -1.32234346 |
| MAP3K9 | -1.32222927 |
| BTBD8 | -1.32158503 |
| AMIGO1 | -1.32154472 |
| IGFBP2 | -1.32039731 |
| ZNF492 | -1.32013462 |
| HNRNPH2 | -1.3194771 |
| CYTH2 | -1.31857304 |
| ANKRD13C | -1.31800162 |
| TYRP1 | -1.31763695 |
| ITGB3BP | -1.31675017 |
| PLXNA1 | -1.31545242 |
| ANKRD13D | -1.3139857 |
| EVI2B | -1.31273828 |
| TTTY15 | -1.31172751 |
| UQCRHL | -1.31125617 |
| GUCY1A2 | -1.30936106 |
| CCDC144NL | -1.30904331 |
| CLUL1 | -1.30785949 |
| ANK2 | -1.30577473 |

| | |
|---|---|
| PTPRS | -1.30492288 |
| GNAQ | -1.30465128 |
| DCTN2 | -1.30370319 |
| AIP | -1.30288319 |
| PEX16 | -1.3026195 |
| ACCS | -1.30233995 |
| MRPL45 | -1.30212992 |
| MCRS1 | -1.30157791 |
| RPS15A | -1.29950797 |
| SLC4A8 | -1.29939188 |
| RASGRP1 | -1.29802577 |
| LRFN5 | -1.29677099 |
| RPS12 | -1.29670227 |
| HIST1H1A | -1.2966862 |
| ECSIT | -1.29468745 |
| ZNF415 | -1.29435717 |
| SAMD12 | -1.29312707 |
| LIN7B | -1.29147296 |
| TOMM5 | -1.29143706 |
| TUBA4B | -1.2884079 |
| SPATS2 | -1.28823816 |
| ATG7 | -1.28738065 |
| PSMD13 | -1.28664882 |
| HLA-DRA | -1.2863059 |
| ZNF740 | -1.28504969 |
| IFI30 | -1.28438183 |
| HARS | -1.28413663 |
| TPD52 | -1.28364275 |
| L2HGDH | -1.2829018 |
| PDCL3 | -1.282151 |
| CD74 | -1.28197275 |
| PIN4 | -1.28137354 |
| CSAD | -1.28077439 |
| ASGR1 | -1.28034047 |
| WDR86 | -1.28000263 |

**Table 3 Top 10% genes positively associated with cortical mean diffusivity**

| Gene | T |
|---|---|
| MYH11 | 5.12758892 |
| TMEM215 | 4.68741316 |
| PECAM1 | 4.41648166 |
| ACTG2 | 4.08416666 |
| NXN | 4.0341803 |
| TAGLN | 4.02089969 |
| FMO2 | 4.01248038 |
| HSPA1A | 4.00106707 |
| TPM2 | 3.99674603 |
| DACT1 | 3.94604664 |
| S100A4 | 3.93058643 |
| CHRNA6 | 3.92851395 |
| RELN | 3.88172712 |
| HSPB1 | 3.79896172 |
| SUSD2 | 3.77971486 |
| COL1A2 | 3.7498961 |
| CNN2 | 3.71668479 |
| AEBP1 | 3.60662833 |
| PDGFD | 3.57324785 |
| REC8 | 3.55656092 |
| HIST1H1D | 3.53935961 |
| ITGA7 | 3.515037 |
| FAM129A | 3.49063133 |
| MXRA8 | 3.47878559 |
| NUPR1 | 3.46994599 |
| EPCAM | 3.37719409 |
| SERPINH1 | 3.31547044 |
| MYL9 | 3.26755235 |
| HSD11B1 | 3.25884554 |
| FLNA | 3.20979134 |
| PLN | 3.20433891 |
| SLITRK6 | 3.20059801 |
| DNMT3B | 3.15088819 |
| ACTA2 | 3.14014535 |
| SLC2A12 | 3.12535372 |
| GLI1 | 3.12524908 |
| HMGN3 | 3.1094747 |
| PGAM2 | 3.09160056 |
| PTCH1 | 3.0711803 |
| CXCL2 | 3.06969929 |
| CRIP1 | 3.04748016 |

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|---|---|
| PHKA2 | 3.03207495 |
| SCN7A | 3.02086388 |
| CD44 | 2.99793781 |
| CD55 | 2.95154979 |
| LMAN2L | 2.95055276 |
| APLNR | 2.95041436 |
| SRGAP1 | 2.91972214 |
| PBX4 | 2.90999714 |
| BTG3 | 2.90709745 |
| OLFML2A | 2.90671971 |
| IGF2BP2 | 2.89351374 |
| CLCA4 | 2.88942107 |
| TOB1 | 2.88490586 |
| MATN2 | 2.84831195 |
| ACO1 | 2.84477082 |
| ANTXR2 | 2.83418584 |
| SPARC | 2.81317311 |
| PLXNB3 | 2.81004269 |
| IQGAP1 | 2.80680644 |
| RGS9 | 2.8055659 |
| KRTAP12-1 | 2.79236935 |
| MYH15 | 2.78641133 |
| ABHD1 | 2.78521365 |
| TRPC4 | 2.77764663 |
| NFE2L3 | 2.77249738 |
| RCN3 | 2.76977722 |
| ANGPT1 | 2.75349288 |
| AVIL | 2.74470122 |
| NPNT | 2.74252132 |
| ENOSF1 | 2.72951565 |
| ITGB4 | 2.71818492 |
| MGAT4C | 2.71792571 |
| DNAJB1 | 2.71700562 |
| MMP14 | 2.71249211 |
| PIRT | 2.70941453 |
| CLEC18B | 2.69843631 |
| TBC1D26 | 2.67639985 |
| CDH23 | 2.6577128 |
| TEKT2 | 2.65748251 |
| CTGF | 2.65369112 |
| FOXO1 | 2.65342167 |
| LYPD1 | 2.64662039 |
| TBL1X | 2.64655904 |

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|---|---|
| LIPC | 2.63696294 |
| RGS8 | 2.63403996 |
| SLCO2A1 | 2.62808752 |
| CMKLR1 | 2.626923 |
| FANCL | 2.62545341 |
| MPST | 2.60767448 |
| GBP2 | 2.60742682 |
| RSPH9 | 2.59235863 |
| PON3 | 2.5864104 |
| CYP2J2 | 2.5846482 |
| DGKG | 2.57488014 |
| KLF4 | 2.57434751 |
| ACTL6A | 2.56577998 |
| EGR4 | 2.56391186 |
| ATF3 | 2.56105598 |
| ALDH3B1 | 2.55860187 |
| VWF | 2.55232767 |
| C11orf96 | 2.54957592 |
| LOC554206 | 2.53661845 |
| PDE5A | 2.53475915 |
| COL16A1 | 2.53021705 |
| PDLIM4 | 2.50687883 |
| HTRA3 | 2.50623596 |
| TBC1D10C | 2.50200452 |
| RFX4 | 2.4940321 |
| TCAP | 2.48495149 |
| PELI2 | 2.47903264 |
| FOS | 2.4764316 |
| ANKRD45 | 2.46244616 |
| PCDHGB4 | 2.4594932 |
| FAM71F1 | 2.45042863 |
| CAV1 | 2.44843359 |
| FAM196A | 2.44554284 |
| ARSE | 2.44510979 |
| CCL19 | 2.44391566 |
| C1QTNF6 | 2.44122275 |
| CCDC154 | 2.43556593 |
| MT1F | 2.42888131 |
| CXCR4 | 2.42607502 |
| DLEC1 | 2.41435055 |
| CCDC152 | 2.41196732 |
| PEG10 | 2.40993231 |
| B3GAT2 | 2.40954078 |

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|---|---:|
| CDH2 | 2.396584 |
| TMEM39A | 2.39288893 |
| NEXN | 2.38992232 |
| IL15 | 2.38866497 |
| NINL | 2.38740081 |
| VANGL2 | 2.38214297 |
| PPP2R1B | 2.37204962 |
| ADAMTS1 | 2.36959817 |
| SP1 | 2.36813181 |
| TP53INP1 | 2.36412902 |
| SGSH | 2.36029885 |
| ZNF735 | 2.35640972 |
| COL4A1 | 2.35403436 |
| MICALL1 | 2.3510238 |
| YY2 | 2.34734225 |
| NDUFS7 | 2.34316978 |
| LXN | 2.3430193 |
| TNRC6C | 2.34197088 |
| CPAMD8 | 2.33496891 |
| AASS | 2.33096442 |
| TIMP3 | 2.32410092 |
| ZNRF3 | 2.31959789 |
| ADAM15 | 2.30446081 |
| SSBP2 | 2.30293845 |
| ASB2 | 2.30126938 |
| GRPR | 2.30058344 |
| OAS3 | 2.29637425 |
| CDK4 | 2.29265865 |
| SREBF1 | 2.29226628 |
| PYGO1 | 2.29050874 |
| EMP3 | 2.28935091 |
| SLC4A11 | 2.28443944 |
| ZNF774 | 2.28040455 |
| DOCK6 | 2.27542592 |
| ITGA8 | 2.27220021 |
| SLC7A2 | 2.27053094 |
| FIBIN | 2.26862204 |
| CALCRL | 2.26675545 |
| EMP1 | 2.26224348 |
| PTTG1IP | 2.26120133 |
| PIGA | 2.2570553 |
| HSD3B7 | 2.25319445 |
| STK33 | 2.24740741 |

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|---|---|
| HLA-G | 2.24404963 |
| CXorf57 | 2.24257146 |
| SPRYD4 | 2.24022351 |
| DNA2 | 2.23918431 |
| GLUD1 | 2.22973387 |
| PLBD1 | 2.22523853 |
| PABPC1L | 2.2210071 |
| CFB | 2.2189998 |
| DOK1 | 2.21299293 |
| LAMB2 | 2.20785302 |
| SLC30A1 | 2.19820485 |
| LOC390705 | 2.19521767 |
| HEY2 | 2.19122286 |
| FLNC | 2.1861167 |
| PCDHGA3 | 2.18359149 |
| SLC22A5 | 2.18204537 |
| IDUA | 2.17912135 |
| LRIG3 | 2.17777961 |
| TMEM209 | 2.17727655 |
| CALD1 | 2.17674845 |
| TMEM170A | 2.16863682 |
| PLXNB2 | 2.16759354 |
| TJP2 | 2.16451862 |
| SEMA5B | 2.15992273 |
| NPC2 | 2.15858509 |
| DDR2 | 2.15584501 |
| DDX31 | 2.15330098 |
| CNR1 | 2.14934286 |
| PI16 | 2.14659334 |
| WWTR1 | 2.14528005 |
| PDE3A | 2.14492851 |
| DNAH12 | 2.14366167 |
| EDNRB | 2.13746868 |
| TIMP2 | 2.13712185 |
| ARHGAP18 | 2.13403841 |
| KRTCAP3 | 2.12933932 |
| SLC9A9 | 2.12906664 |
| CYP7B1 | 2.11997683 |
| SF3B4 | 2.11881495 |
| PAFAH1B3 | 2.11322086 |
| IFI44 | 2.1127917 |
| LRP2 | 2.10924392 |
| BTNL9 | 2.10829621 |

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|---|---|
| TXNRD1 | 2.1066461 |
| RELL1 | 2.10182283 |
| COL7A1 | 2.10137269 |
| VWCE | 2.09810301 |
| HIST1H2AG | 2.0974765 |
| GRP | 2.09141679 |
| SLC13A5 | 2.0908053 |
| DYNLT1 | 2.08316053 |
| ERAP1 | 2.07992778 |
| CARD6 | 2.07670641 |
| AP1G2 | 2.07209082 |
| CC2D2A | 2.06902449 |
| FHL5 | 2.06889578 |
| THSD4 | 2.06790396 |
| CASC2 | 2.06476458 |
| UGT8 | 2.0641354 |
| RERG | 2.06321093 |
| INTU | 2.06247488 |
| C12orf60 | 2.06242305 |
| FMO5 | 2.06183366 |
| PRR14 | 2.05884491 |
| CHRAC1 | 2.05882268 |
| HSD17B3 | 2.05582558 |
| MCHR1 | 2.05505344 |
| MICALL2 | 2.05201546 |
| LRRC1 | 2.04718923 |
| TP53RK | 2.04530515 |
| JAG1 | 2.04522006 |
| PTGDS | 2.04344313 |
| PEX12 | 2.04196138 |
| C10orf105 | 2.03881108 |
| TTPA | 2.03746752 |
| ARHGAP10 | 2.02901491 |
| TRIM45 | 2.01700202 |
| STEAP3 | 2.01601331 |
| CLTCL1 | 2.01530211 |
| CARD8 | 2.00961402 |
| ACACB | 2.00437784 |
| SLC27A6 | 2.00300274 |
| TRPS1 | 2.00095766 |
| LRFN2 | 1.99605784 |
| TBX2 | 1.99563218 |
| PLVAP | 1.99520238 |

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|---|---|
| COL18A1 | 1.99416087 |
| FOXC1 | 1.99229339 |
| IQCD | 1.99143674 |
| SLC39A12 | 1.98912489 |
| ABCA1 | 1.9861727 |
| BNIP2 | 1.98373186 |
| ELOVL5 | 1.98346462 |
| APH1B | 1.9828066 |
| MYOM1 | 1.9822725 |
| TMPRSS5 | 1.9820127 |
| ISG20 | 1.97797471 |
| ELL3 | 1.9740502 |
| CXADRP3 | 1.97402146 |
| ZNF835 | 1.97095604 |
| TIMP1 | 1.97080201 |
| ITGA1 | 1.97014826 |
| GPR62 | 1.96801127 |
| HIST1H2AH | 1.96724659 |
| KCNJ6 | 1.96555557 |
| LOC400684 | 1.96156366 |
| LDB3 | 1.9559535 |
| PARD3B | 1.95267916 |
| ALCAM | 1.9488516 |
| H2AFJ | 1.94704726 |
| TMEM38B | 1.94179798 |
| PLD5 | 1.94068108 |
| SEC61A1 | 1.93438392 |
| PCDH18 | 1.92941392 |
| TAS2R30 | 1.92652222 |
| PLEKHG2 | 1.92415672 |
| GPR83 | 1.92349695 |
| SMURF2 | 1.92310378 |
| C8orf58 | 1.92273459 |
| PLAC8L1 | 1.92184232 |
| TAGLN2 | 1.92093066 |
| IGF2BP3 | 1.91558533 |
| STT3A | 1.91469413 |
| FAM111A | 1.9141154 |
| ANG | 1.91145999 |
| DLL1 | 1.90638782 |
| FKBP5 | 1.90629177 |
| FREM1 | 1.90543697 |
| PPP2R3B | 1.89999382 |

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|---|---|
| CHRNA3 | 1.89812313 |
| PLTP | 1.89612465 |
| ZCCHC3 | 1.89501787 |
| POLH | 1.89466954 |
| CHST14 | 1.89457693 |
| MORC4 | 1.89393999 |
| ZC3H4 | 1.89150249 |
| COL4A2 | 1.89144479 |
| PLEKHH2 | 1.88810393 |
| FN1 | 1.88779562 |
| HEG1 | 1.88484207 |
| TRRAP | 1.88458581 |
| CFD | 1.88218566 |
| ADCY4 | 1.8815612 |
| MALL | 1.88106371 |
| PLEKHA7 | 1.87940241 |
| SEMA3C | 1.87816744 |
| S100A6 | 1.87250317 |
| XKR8 | 1.87023664 |
| LRIG1 | 1.86803956 |
| HIST1H2AD | 1.86303758 |
| ACCS | 1.86301292 |
| DYRK3 | 1.8614566 |
| HIST1H2AK | 1.86116118 |
| TTLL4 | 1.85678737 |
| PALMD | 1.85581896 |
| FOXF2 | 1.8547792 |
| NPFF | 1.85076952 |
| FADS1 | 1.85067393 |
| C11orf71 | 1.84756118 |
| MST1 | 1.84545912 |
| CD163 | 1.84177618 |
| DSCAML1 | 1.84142531 |
| GEM | 1.83959436 |
| PLP2 | 1.83959104 |
| LOXL3 | 1.83854463 |
| HHIP | 1.83767201 |
| TJAP1 | 1.83729437 |
| SMAD5 | 1.83660396 |
| C1orf56 | 1.8345601 |
| ZCCHC12 | 1.83441622 |
| EML3 | 1.83322012 |
| FUK | 1.8298916 |

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|---|---|
| PLSCR4 | 1.82915112 |
| ISOC1 | 1.8263964 |
| KDM5B | 1.82138127 |
| EHD2 | 1.82110379 |
| LIFR | 1.81876383 |

**Table 4 Top 10% genes negatively associated with cortical mean diffusivity**

| Gene | T |
|---|---|
| ZBBX | -5.8655597 |
| COL10A1 | -4.9772037 |
| RPH3A | -4.7870584 |
| LRRC20 | -4.7790418 |
| GALNTL5 | -4.7187389 |
| SERPINF1 | -4.6996848 |
| PDK3 | -4.6960537 |
| KCNIP3 | -4.5922382 |
| RP9P | -4.4839389 |
| PHLDA2 | -4.398832 |
| BEND5 | -4.382623 |
| CDT1 | -4.2447609 |
| TM6SF1 | -4.1233527 |
| LPL | -4.1044895 |
| NOS2 | -4.0990248 |
| PINK1 | -4.0962372 |
| KRTAP19-8 | -4.0900589 |
| XKR9 | -4.0876736 |
| SPHK2 | -4.0811417 |
| NEFL | -4.0787576 |
| LYRM4 | -4.0755687 |
| FAM162B | -4.0746256 |
| SLAMF7 | -4.0468249 |
| KIF17 | -4.0418209 |
| COPS7A | -4.0396666 |
| MAPK10 | -3.9996099 |
| DCAF8L2 | -3.9879531 |
| GHITM | -3.9830406 |
| DUSP3 | -3.9422763 |
| KLHDC3 | -3.9289819 |
| IPCEF1 | -3.9253214 |
| CD79A | -3.8688458 |
| CALM2 | -3.8596883 |
| MGLL | -3.8583534 |
| AMN1 | -3.8511895 |
| CRYBB2P1 | -3.8455618 |
| ALX3 | -3.8407556 |
| C3orf18 | -3.839471 |
| STRBP | -3.8372414 |
| OR5L2 | -3.8306 |
| GNG3 | -3.8194455 |

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|---|---|
| RHEB | -3.8166614 |
| HOXB13 | -3.8090339 |
| CDH8 | -3.8077859 |
| HLA-DRB3 | -3.7947233 |
| UBE2QL1 | -3.7939761 |
| FDX1L | -3.7763963 |
| HAMP | -3.7709883 |
| RIMS1 | -3.7429875 |
| SURF2 | -3.7321876 |
| LRRK1 | -3.727944 |
| ANKRD42 | -3.7248841 |
| HRASLS | -3.7232395 |
| BCORP1 | -3.7226912 |
| SLC22A7 | -3.713603 |
| NRN1 | -3.7001958 |
| C3orf14 | -3.6949514 |
| IRX5 | -3.6865178 |
| ATXN7L3 | -3.6786286 |
| DHRS7B | -3.6774447 |
| FRAT2 | -3.6730785 |
| PLXDC1 | -3.6727155 |
| UBE2D4 | -3.6683898 |
| BID | -3.6628081 |
| SLC2A5 | -3.6580734 |
| GPATCH4 | -3.6564407 |
| ATF4 | -3.6557671 |
| TUSC2 | -3.6550299 |
| TREM2 | -3.6544525 |
| OCIAD2 | -3.6427161 |
| DNAJC19 | -3.6274626 |
| DBNDD1 | -3.6240873 |
| C14orf177 | -3.6071964 |
| SPEF1 | -3.5990108 |
| COL24A1 | -3.5910885 |
| SNRNP25 | -3.5883887 |
| CLEC4M | -3.5845657 |
| SPATS2 | -3.5835463 |
| STAMBPL1 | -3.5794437 |
| CLEC2L | -3.5703084 |
| SAMD14 | -3.5703021 |
| TAGLN3 | -3.5676901 |
| OPA3 | -3.5650386 |
| UCHL3 | -3.5625757 |

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| SMPX | -3.561534 |
| MED10 | -3.5610282 |
| ABCC12 | -3.5593704 |
| TMEM232 | -3.554067 |
| NCKAP1 | -3.5490832 |
| ST8SIA5 | -3.5477037 |
| YIPF1 | -3.5360179 |
| GPR179 | -3.5350107 |
| UROS | -3.5298639 |
| ZNF385B | -3.5296996 |
| CAPS2 | -3.5277346 |
| DTX4 | -3.522191 |
| PSMG3 | -3.5219828 |
| RB1CC1 | -3.5196222 |
| PPP1R11 | -3.5173623 |
| POP4 | -3.5121318 |
| PPM1H | -3.5120143 |
| OAT | -3.5094982 |
| WNT10A | -3.5076684 |
| POPDC3 | -3.5045966 |
| UST | -3.5000296 |
| ITGB1BP1 | -3.4991998 |
| MYBPHL | -3.4930255 |
| HLA-DRA | -3.4922798 |
| C1orf216 | -3.4881014 |
| UGP2 | -3.4865481 |
| FBXO9 | -3.4828873 |
| SNX32 | -3.4816723 |
| IGFBP6 | -3.4762212 |
| NARS | -3.4748032 |
| GLMN | -3.4733283 |
| SDCCAG8 | -3.4728704 |
| GMPR2 | -3.4630842 |
| MICAL2 | -3.4614736 |
| C6orf106 | -3.4591499 |
| CA10 | -3.4551213 |
| RANBP9 | -3.4507457 |
| THOC7 | -3.4460957 |
| LOC100126784 | -3.4457085 |
| ALOX5 | -3.4444367 |
| RNF168 | -3.4432099 |
| COL5A2 | -3.4426424 |

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|---|---|
| TIMM17A | -3.4392889 |
| LRRC6 | -3.438557 |
| TRNP1 | -3.4375234 |
| C3AR1 | -3.4325996 |
| PDCL3 | -3.4299873 |
| ZNF720 | -3.4275251 |
| VTI1B | -3.4213828 |
| STAU2 | -3.4201617 |
| HMGCS2 | -3.4196324 |
| ATP6V1E2 | -3.4123917 |
| SYCP2L | -3.4074836 |
| KAZALD1 | -3.4070478 |
| NDUFB9 | -3.4059315 |
| RNF214 | -3.4001738 |
| CYP2E1 | -3.3994706 |
| SAE1 | -3.3939098 |
| TOMM5 | -3.3810352 |
| RASL10B | -3.3770124 |
| FAM182B | -3.3763827 |
| HSD11B1L | -3.3713955 |
| RPA4 | -3.3695793 |
| POLE4 | -3.3623392 |
| ARMCX3 | -3.3616474 |
| ITPK1 | -3.35991 |
| SLC35C1 | -3.3544148 |
| SHC3 | -3.3534697 |
| CTSS | -3.3506701 |
| TTR | -3.3466778 |
| NHLRC4 | -3.3435683 |
| PSMC3 | -3.3401919 |
| LRRC39 | -3.3340243 |
| POLD4 | -3.3293712 |
| TOX | -3.3291598 |
| SH2D2A | -3.3230876 |
| SNN | -3.3217836 |
| ST6GAL1 | -3.3216006 |
| KIAA1549 | -3.3182591 |
| HLA-DMB | -3.3172422 |
| FNDC4 | -3.3134679 |
| TRIM15 | -3.3080936 |
| PPP1R14C | -3.3062254 |
| SLC6A12 | -3.299078 |
| COX7A2 | -3.2915336 |

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| NEFM | -3.2909491 |
| BECN1 | -3.2885907 |
| KCNQ5 | -3.2881012 |
| BCL2L2 | -3.2872428 |
| RPS19BP1 | -3.2864578 |
| OLFM1 | -3.2836959 |
| ZNF143 | -3.2812519 |
| COL12A1 | -3.2799833 |
| PARD6A | -3.2740508 |
| CIAPIN1 | -3.274019 |
| PLEKHM2 | -3.2738832 |
| ITGB2 | -3.2730424 |
| RGS4 | -3.271795 |
| NEFH | -3.271033 |
| HEXIM1 | -3.2699336 |
| ADRA1D | -3.2669017 |
| VPS41 | -3.2667559 |
| POP7 | -3.2646088 |
| CARS | -3.2641428 |
| CCM2 | -3.2587769 |
| KIF5A | -3.2553056 |
| ITGB3BP | -3.2523105 |
| SNTG1 | -3.2500039 |
| ECT2 | -3.2472209 |
| CACNG6 | -3.2471107 |
| KCNQ3 | -3.2470006 |
| QPCT | -3.2437864 |
| UNC13A | -3.2389445 |
| GLRX5 | -3.2371396 |
| ZNF814 | -3.2364872 |
| CCDC25 | -3.2308117 |
| GPR158 | -3.2248055 |
| COQ10B | -3.2224284 |
| BOLA3 | -3.221223 |
| AMACR | -3.2183421 |
| PHYH | -3.2162932 |
| RIMKLA | -3.2160119 |
| PITRM1 | -3.2133559 |
| AVEN | -3.2052583 |
| ZBTB8OS | -3.2024552 |
| LCE3C | -3.2004237 |
| UBL4A | -3.1976092 |
| ZSWIM7 | -3.1961201 |

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| ZNF622 | -3.1939562 |
| NOMO1 | -3.193099 |
| PEF1 | -3.1921605 |
| PIN1 | -3.1899783 |
| CCNDBP1 | -3.1875522 |
| CNTNAP2 | -3.1865165 |
| NUDT15 | -3.1862165 |
| PTPRT | -3.1822965 |
| ZBTB22 | -3.1809087 |
| DENR | -3.1786046 |
| TNFAIP1 | -3.1780485 |
| PMPCB | -3.1765259 |
| PAK1 | -3.1745147 |
| LSM10 | -3.1742813 |
| WDR37 | -3.1704636 |
| C12orf10 | -3.1660301 |
| SLC25A5 | -3.1648261 |
| INSM2 | -3.1645503 |
| TPI1 | -3.164391 |
| NDUFB8 | -3.1602704 |
| LINC00319 | -3.1594763 |
| METTL13 | -3.1583513 |
| NAALADL2 | -3.1549221 |
| NDUFB3 | -3.1548602 |
| RAB3D | -3.1529541 |
| PDXP | -3.1529504 |
| NELL1 | -3.1513976 |
| TMSB4X | -3.1512123 |
| IMMT | -3.1494664 |
| TIMM23 | -3.1485231 |
| PAAF1 | -3.1448611 |
| FAM43B | -3.1403015 |
| ZNF25 | -3.1397585 |
| MRPS15 | -3.1386009 |
| MANBAL | -3.1354403 |
| CEND1 | -3.1329066 |
| CDCA8 | -3.1327119 |
| C12orf49 | -3.1323094 |
| COX7A1 | -3.1306386 |
| CGREF1 | -3.1302808 |
| HOXD9 | -3.126221 |
| MAT2B | -3.1258023 |
| EPHB6 | -3.1229899 |

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|---|---|
| PTEN | -3.120597 |
| NPM2 | -3.1153899 |
| GNB5 | -3.1153318 |
| XK | -3.1140426 |
| TRUB1 | -3.1084473 |
| RAD1 | -3.1075581 |
| ADORA1 | -3.1074817 |
| MRPL11 | -3.1070203 |
| KCNJ12 | -3.1044501 |
| MAGEA6 | -3.103821 |
| ODC1 | -3.1031378 |
| C2 | -3.1004445 |
| CHCHD4 | -3.0990809 |
| UCHL5 | -3.0990026 |
| HABP4 | -3.0978301 |
| MIR22HG | -3.0965323 |
| PTPN22 | -3.0958233 |
| HAGH | -3.0949602 |
| AGMAT | -3.0942233 |
| ANKRD33B | -3.0939413 |
| HYLS1 | -3.092776 |
| TOMM22 | -3.0922473 |
| VPS26A | -3.0914358 |
| TIMM8A | -3.0864952 |
| BCAP31 | -3.0856896 |
| ST6GALNAC6 | -3.0803902 |
| C16orf95 | -3.080255 |
| SDHB | -3.0781025 |
| CYCS | -3.0736571 |
| ISPD | -3.0691856 |
| ARHGAP25 | -3.063869 |
| IMP4 | -3.0587017 |
| FAM89B | -3.0584486 |
| HARS | -3.0571914 |
| BMS1 | -3.0569092 |
| RPL7 | -3.0555406 |
| CLN6 | -3.0528616 |
| TRIM41 | -3.0498377 |
| DMXL2 | -3.0490833 |
| FBXL16 | -3.0477567 |
| SPIB | -3.0450003 |
| GGN | -3.0437146 |

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| MAP1B | -3.0433452 |
| CMC1 | -3.0419273 |
| SCN8A | -3.04158 |
| SERPINB2 | -3.0415013 |
| SEC24D | -3.0414304 |
| RABEPK | -3.0396739 |
| TAF13 | -3.0367734 |
| MFSD11 | -3.0362661 |
| FARSA | -3.0338896 |
| UQCRH | -3.0331346 |
| GLO1 | -3.032069 |
| TMEM38A | -3.029478 |
| FLRT3 | -3.0277187 |
| RUNDC3A | -3.0269121 |
| LCE1C | -3.0227132 |
| TATDN2 | -3.0218022 |
| OTUD6A | -3.0214787 |
| FAM32A | -3.0205459 |
| RDH12 | -3.0190742 |
| SAP30L | -3.0174301 |
| AAK1 | -3.0173688 |
| C11orf74 | -3.0168268 |
| TATDN1 | -3.0152343 |
| TMEM132C | -3.0144846 |
| SLC39A13 | -3.0143978 |
| DPT | -3.0108119 |
| ANKRD34A | -3.0107554 |
| LYRM7 | -3.0100737 |
| ADO | -3.0099907 |
| PFDN4 | -3.0098491 |
| VPS37A | -3.0097798 |
| HIGD1B | -3.0070244 |
| KCNV1 | -3.0054493 |
| DYTN | -3.0053672 |
| OR2W5 | -3.0034317 |
| CCKBR | -3.0013705 |
| CHAF1A | -3.0003092 |
| SLC22A9 | -2.9999556 |
| FOXRED1 | -2.9988433 |
| CDKL3 | -2.9987014 |
| CISD1 | -2.9977168 |
| SUSD5 | -2.9972606 |
| CPLX1 | -2.9972079 |

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| ESM1 | -2.9969919 |
| UPK3B | -2.9968922 |
| DLD | -2.9968551 |
| MRPL53 | -2.9968073 |
| AARS | -2.9957761 |
| MPG | -2.9952696 |
| MRPL15 | -2.9923019 |
| ARHGAP26 | -2.9914209 |
| NSMCE2 | -2.9890005 |
| RAB15 | -2.9846225 |
| OSTF1 | -2.9796759 |
| WDYHV1 | -2.9791214 |
| CBX7 | -2.9775215 |
| FMR1 | -2.9769321 |
| PPP3R1 | -2.9754366 |
| CIDECP | -2.9753592 |
| PGP | -2.9736037 |
| B3GNT6 | -2.97101 |
| UBLCP1 | -2.9706327 |
| NDUFA12 | -2.9692105 |
| NAP1L5 | -2.9674989 |
| PRUNE2 | -2.9670344 |
| PTPN4 | -2.9664737 |
| RPL37A | -2.9629367 |
| DCK | -2.9614573 |
| RNF157 | -2.9598371 |
| GPR108 | -2.9598209 |
| LAMB3 | -2.9593732 |
| VDAC2 | -2.9577019 |
| CCDC3 | -2.9576254 |
| FBXO45 | -2.9569135 |
| PCSK1 | -2.9565875 |
| LETMD1 | -2.9565396 |
| ING1 | -2.9564847 |
| TMX4 | -2.9548158 |
| SUPT3H | -2.9540816 |
| SNX17 | -2.9538807 |
| RFTN1 | -2.9532042 |
| COX4I1 | -2.9526547 |
| GRK4 | -2.9513881 |
| DEF8 | -2.9507727 |
| CFL1P1 | -2.9501678 |
| DENND4B | -2.9493077 |

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| CA13 | -2.9482297 |
| ISX | -2.9473088 |
| TRAK2 | -2.9472445 |
| ETS2 | -2.9469902 |
| NCALD | -2.9462042 |
| ITPA | -2.9440395 |
| KHDC1 | -2.9417446 |
| ZNF576 | -2.9410736 |
| FRS3 | -2.9399925 |
| AQP7P1 | -2.9396032 |
| OXR1 | -2.9384721 |
| RASGRP2 | -2.9370921 |
| TRMT61B | -2.933693 |
| USE1 | -2.9327809 |
| STOML2 | -2.9323424 |
| SNRPA1 | -2.9304029 |
| DNAJA2 | -2.9298551 |
| PRMT5 | -2.9263542 |
| CTNNA2 | -2.9262565 |
| PCDHB15 | -2.9250645 |
| F8 | -2.9234077 |
| RPUSD4 | -2.9214044 |
| HSPA9 | -2.9208829 |
| SMARCC2 | -2.9188935 |
| UQCRFS1 | -2.9188521 |
| TMX3 | -2.9187129 |
| OSBPL1A | -2.9181809 |
| COX5A | -2.914463 |
| AIF1 | -2.9142186 |
| ZNF593 | -2.9136821 |
| SLC25A26 | -2.9115827 |
| SLC38A6 | -2.9109502 |
| GAS5 | -2.9096722 |
| NARF | -2.9089825 |
| BMP10 | -2.90601 |
| RPL9 | -2.9059926 |
| MCAT | -2.9045671 |
| HIGD1A | -2.9010368 |
| PPP1R12A | -2.8996641 |
| EIF2B5 | -2.8982553 |
| GABARAPL3 | -2.8952401 |
| SLC25A3 | -2.893825 |

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| ABCF1 | -2.8923317 |
| RGS7 | -2.8922156 |
| MRPS22 | -2.892172 |
| TCTE1 | -2.8917361 |
| TUBG2 | -2.8914627 |
| ASGR2 | -2.8899517 |
| KCNMB4 | -2.8892843 |
| FCER1G | -2.8886771 |
| ATP6V1G2 | -2.8872671 |
| KRT222 | -2.8867537 |
| STK39 | -2.8831464 |
| NEDD8 | -2.8825156 |
| SNRNP27 | -2.8823623 |
| GOT1 | -2.8822738 |
| TPMT | -2.8812801 |
| CCT6P1 | -2.8809917 |
| PSMD12 | -2.8808875 |
| NGLY1 | -2.8790277 |
| TAF9 | -2.878323 |
| FAM168B | -2.87804 |
| FAM20A | -2.8775358 |
| ACTR1B | -2.876342 |
| RIT2 | -2.8756852 |
| KLHL8 | -2.8755231 |
| RHOBTB2 | -2.8753661 |
| C7orf57 | -2.8737425 |
| CCDC43 | -2.8719389 |
| PFKM | -2.8704867 |
| TUBG1 | -2.8692839 |
| MTX2 | -2.8682065 |
| RSRC1 | -2.8681108 |
| UQCRHL | -2.8669789 |
| ENTPD4 | -2.8665177 |
| HECA | -2.8649216 |
| RPL29P2 | -2.8649079 |
| ZNF223 | -2.8632976 |
| BBS7 | -2.862998 |
| POLDIP2 | -2.862425 |
| MIR205HG | -2.8618493 |
| TXNL4A | -2.8616084 |
| DCTN6 | -2.8601309 |
| CHI3L1 | -2.8591961 |
| ZNF213 | -2.8546363 |

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| KLK9 | -2.8532133 |
| CRYM | -2.8513979 |
| SULT2B1 | -2.8501127 |
| ZNF517 | -2.8497915 |
| MFF | -2.8486746 |
| RNFT2 | -2.8485507 |
| SGTB | -2.8484973 |
| DENND2D | -2.8455464 |
| DRG1 | -2.8450514 |
| TRIM44 | -2.8450299 |
| PDPN | -2.8434371 |
| TPK1 | -2.8417366 |
| STAT6 | -2.8406249 |
| LDB2 | -2.8404259 |
| ENDOG | -2.8395742 |
| SERPINI1 | -2.838105 |
| RP9 | -2.8337881 |
| ESRRA | -2.8320352 |
| HNF1A-AS1 | -2.8319377 |
| ST8SIA1 | -2.8316774 |
| DGKI | -2.8287841 |
| FARS2 | -2.8278116 |
| ZFAND2A | -2.8258835 |
| RCHY1 | -2.8248237 |
| IRAK1 | -2.824327 |
| MPPED1 | -2.8242948 |
| NME5 | -2.8229657 |
| AQP11 | -2.8223731 |
| ERCC1 | -2.8213623 |
| ZCRB1 | -2.8200021 |
| ZW10 | -2.8197166 |
| RNASEH2B | -2.8178685 |
| PGAM1 | -2.8178172 |
| SLC4A9 | -2.817338 |
| DHRS11 | -2.8158844 |
| SERGEF | -2.8151598 |
| KCNH1 | -2.8150025 |
| TOMM20L | -2.814146 |
| AKTIP | -2.8138121 |
| BNIP3 | -2.8113379 |
| KLK14 | -2.8111149 |
| MGST3 | -2.8100351 |
| DRAP1 | -2.8076676 |

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| ATP1B3 | -2.8050192 |
| TERF2 | -2.8048712 |
| SATB1 | -2.8040941 |
| RHO | -2.8039427 |
| HLA-DRB1 | -2.8027065 |
| WSB2 | -2.8018908 |
| CA11 | -2.801106 |
| RGS10 | -2.8009734 |
| TMEM163 | -2.7992869 |
| RPL31P11 | -2.7986664 |
| PPP3R2 | -2.7977942 |
| CDC123 | -2.7970828 |
| NMNAT2 | -2.7961198 |
| DYNC1I1 | -2.7960227 |
| MRPS18C | -2.7955366 |
| FAM3C | -2.7955125 |
| TM2D1 | -2.7942331 |
| FKBP3 | -2.7920511 |
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| SH3KBP1 | -2.7896461 |
| SCYL1 | -2.7888954 |
| OXA1L | -2.7877594 |
| TM7SF3 | -2.7854621 |
| AHNAK2 | -2.7850014 |
| A2ML1 | -2.7838576 |
| ASB13 | -2.7830114 |
| CAPZA2 | -2.7828072 |
| ARSG | -2.782224 |
| ABI3 | -2.7819786 |
| FAP | -2.7816527 |
| GSTZ1 | -2.7813813 |
| CHN1 | -2.7808479 |
| EML6 | -2.7807637 |
| HLA-DPA1 | -2.7802845 |
| SPSB4 | -2.7801353 |
| PSMC5 | -2.7773812 |
| TRUB2 | -2.7764754 |
| MPND | -2.7752362 |
| ARL6IP4 | -2.7751111 |
| PRPSAP1 | -2.7750009 |
| RPP40 | -2.7747521 |
| LARP1B | -2.7743731 |
| MYO5A | -2.7722897 |

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| HCRTR1 | -2.7710502 |
| B4GALT6 | -2.7700447 |
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| FBXO6 | -2.7683296 |
| AGBL2 | -2.7671152 |
| FLVCR1-AS1 | -2.7661802 |
| PACRG | -2.7660257 |
| DDHD2 | -2.7655324 |
| TMEM150B | -2.7645188 |
| CETN4P | -2.7645008 |
| TUBA8 | -2.7631009 |
| FKBP1B | -2.7627268 |
| C21orf58 | -2.761731 |
| NIPSNAP1 | -2.7614464 |
| GPR78 | -2.7607427 |
| TLN2 | -2.7604562 |
| ALPP | -2.7590278 |
| GRIA3 | -2.7581289 |
| FGF12 | -2.757237 |
| DPP10 | -2.7571413 |
| ZIC4 | -2.7551814 |
| UMOD | -2.7550965 |
| GRK5 | -2.7523248 |
| CARTPT | -2.7513172 |
| TFPT | -2.7504056 |
| EXTL1 | -2.7488631 |
| KIF3B | -2.7488555 |
| WASF3 | -2.7487558 |
| PPP2R2C | -2.7487013 |
| GPR153 | -2.7485733 |
| OPTN | -2.7483694 |
| GGNBP2 | -2.7468265 |
| COG6 | -2.7467625 |
| MECR | -2.7460891 |
| ANKRD52 | -2.7436556 |
| UBE2F | -2.7432943 |
| ZNF358 | -2.7427356 |
| HAR1A | -2.7426083 |
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| RAP1GDS1 | -2.7389063 |
| CTSD | -2.7388537 |

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| PTRHD1 | -2.7382219 |
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| ZBTB26 | -2.7331454 |
| OLFM3 | -2.7331015 |
| SLC35F3 | -2.7324128 |
| TSR1 | -2.7313001 |
| PRDM10 | -2.7306943 |
| GMFB | -2.7293993 |
| TMEM126A | -2.726737 |
| PIP4K2C | -2.7266375 |
| VSNL1 | -2.7261276 |
| CDH22 | -2.7234324 |
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| NNT | -2.7186096 |
| LY6E | -2.7185202 |
| PYY2 | -2.7182252 |
| DDX1 | -2.7179384 |
| RRP12 | -2.7172949 |
| PPM1A | -2.7158605 |
| PLCL2 | -2.7155626 |
| COASY | -2.7149953 |
| SYTL2 | -2.7143944 |
| SV2C | -2.711352 |
| SCGB1A1 | -2.7102053 |
| LOC407835 | -2.7097351 |
| EIF4G1 | -2.7095064 |
| YWHAG | -2.7088348 |
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| KIF20A | -2.7077901 |
| ACTN2 | -2.7075992 |
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| SERP2 | -2.7037803 |
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| CCNI | -2.700584 |

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| ZDHHC17 | -2.6976756 |
| ROPN1L | -2.6963491 |
| NDUFA4 | -2.6961294 |
| MRTO4 | -2.6955612 |
| ERRFI1 | -2.6952509 |
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| COL19A1 | -2.6907982 |
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| SLC17A9 | -2.6842744 |
| SLAMF8 | -2.6833399 |
| CORO2A | -2.6830872 |
| RTKN2 | -2.6828184 |
| FITM1 | -2.6817405 |
| COPS8 | -2.6810386 |
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| CBX6 | -2.6806602 |
| FAM49B | -2.6801498 |
| RPL21P44 | -2.6793414 |
| YARS | -2.6781928 |
| CD53 | -2.6780712 |
| NT5M | -2.6775535 |
| NAP1L2 | -2.6771026 |
| ZEB1 | -2.6766573 |
| SDHD | -2.6762086 |
| CDK5 | -2.6755352 |
| MAD2L1BP | -2.675333 |
| RTN4RL2 | -2.6745079 |
| ATP6V0E2 | -2.6731728 |
| KNG1 | -2.6726878 |
| KCNA2 | -2.6724103 |
| VAX2 | -2.6723635 |
| PPP1R15B | -2.672055 |
| RTN2 | -2.6716894 |
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| DLGAP1 | -2.6706033 |
| SUCLA2 | -2.6699873 |
| UQCRC1 | -2.6695442 |

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| SORCS1 | -2.668203 |
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| TDRD7 | -2.6663523 |
| ZNHIT3 | -2.666337 |
| TUBB8 | -2.6646364 |
| PCMT1 | -2.6646127 |
| RASD1 | -2.664271 |
| CASQ1 | -2.6639485 |
| MTRF1L | -2.6628615 |
| CHML | -2.6626317 |
| ICA1 | -2.6621383 |
| TMEM173 | -2.6614419 |
| MAN2B2 | -2.6609641 |
| CSF3R | -2.6597524 |
| SERINC3 | -2.6593319 |
| TSPAN7 | -2.6590708 |
| CCL25 | -2.6573376 |
| ALKBH6 | -2.6570435 |
| NDUFB5 | -2.6569323 |
| PCGF3 | -2.6553856 |
| MCOLN1 | -2.6544028 |
| CPLX2 | -2.6529525 |
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| ASB4 | -2.6503084 |
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| GAP43 | -2.6493235 |
| MPP6 | -2.6460541 |
| PITPNM1 | -2.6459434 |
| HINT1 | -2.6453678 |
| CCDC124 | -2.6444246 |
| NGEF | -2.644377 |
| AKT3 | -2.6440423 |
| NRIP3 | -2.6438811 |
| WDR45 | -2.64139 |
| RSPH3 | -2.6396979 |
| IDH3B | -2.6385656 |
| ELAVL4 | -2.6383551 |
| APEH | -2.636391 |
| TRAF3IP3 | -2.6362758 |
| PRKAB1 | -2.6349174 |

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| CCND2 | -2.6328885 |
| CHMP4A | -2.6323448 |
| VAMP1 | -2.6322344 |
| PPP2R2D | -2.6319321 |
| RNASEH1 | -2.6317499 |
| MRPL12 | -2.6313425 |
| C12orf43 | -2.6295372 |
| OR4K2 | -2.6284741 |
| NDUFA7 | -2.6267802 |
| PELI3 | -2.6259826 |
| ME3 | -2.6259797 |
| RPSAP52 | -2.6259369 |
| RPF2 | -2.6252764 |
| TWF2 | -2.6242597 |
| UBE2E2 | -2.623375 |
| IL17RE | -2.6224403 |
| DCTD | -2.6215237 |
| ARHGEF4 | -2.6201438 |
| MMADHC | -2.6196376 |
| ST13P4 | -2.619548 |
| WDR93 | -2.6190425 |
| ASS1 | -2.618842 |
| TBC1D9 | -2.618477 |
| FEZ2 | -2.6184573 |
| TASP1 | -2.6179414 |
| CALM3 | -2.6178629 |
| C9orf163 | -2.6177007 |
| NAT8L | -2.6173793 |
| XCR1 | -2.6157607 |
| STX1A | -2.6156634 |
| NPW | -2.6156591 |
| TOLLIP | -2.6154364 |
| MAP3K10 | -2.6147907 |
| SLC25A11 | -2.6146234 |
| TUBA1A | -2.6146003 |
| TCTEX1D1 | -2.6140032 |
| CCNB1 | -2.6139739 |
| COL11A1 | -2.6134878 |
| COMMD9 | -2.6132491 |
| RWDD2B | -2.6119905 |
| SYNGR3 | -2.6113128 |
| GPX5 | -2.6110185 |

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| KCNJ8 | -2.610291 |
| SBDSP1 | -2.6098307 |
| C1orf123 | -2.6092331 |
| MNAT1 | -2.6084234 |
| LSM1 | -2.6083064 |
| MTCH2 | -2.6079945 |
| FBXW5 | -2.6079365 |
| FAM9B | -2.6079124 |
| GLRX | -2.6072725 |
| CXCL3 | -2.606671 |
| GLRX3 | -2.6062488 |
| ARMC6 | -2.6060692 |
| FBXO16 | -2.6036095 |
| IDNK | -2.602198 |
| RAD23B | -2.6015554 |
| HMGB3 | -2.6014787 |
| HSPB3 | -2.5985089 |
| BAG1 | -2.5975532 |
| DPP8 | -2.597103 |
| RNF14 | -2.5962628 |
| MRPL51 | -2.5961981 |
| C9orf129 | -2.5959534 |
| DNAJC4 | -2.592662 |
| GPR161 | -2.5917895 |
| GUK1 | -2.5908548 |
| TAF1D | -2.5905283 |
| TMEM8B | -2.5904412 |
| CISD3 | -2.5896221 |
| CENPK | -2.5893982 |
| SLC30A9 | -2.5888733 |
| NCK2 | -2.5886757 |
| PPP1R3F | -2.5875002 |
| PAIP2 | -2.5858666 |
| SPDEF | -2.5840326 |
| RPS27 | -2.583432 |
| MTUS2 | -2.5820604 |
| NSDHL | -2.5817982 |
| DYNLT3 | -2.5817038 |
| MRPL48 | -2.5806448 |
| GOLGA5 | -2.5792632 |
| FAM135B | -2.579032 |
| EMC3 | -2.5788407 |
| ENPP5 | -2.5784064 |

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| ITM2B | -2.578375 |
| NDUFAF1 | -2.5771953 |
| PKD2L1 | -2.5763228 |
| ETV6 | -2.575834 |
| APOL2 | -2.575735 |
| RNF216 | -2.5747205 |
| CNIH3 | -2.5729808 |
| UBAC2 | -2.5728112 |
| DUS1L | -2.5718428 |
| DND1 | -2.5709478 |
| NOA1 | -2.570822 |
| ARMC10 | -2.5706624 |
| NIPA1 | -2.5697766 |
| SARS | -2.5684993 |
| PRDM11 | -2.5684252 |
| TTTY15 | -2.5682419 |
| RPUSD1 | -2.5679161 |
| CALML3 | -2.5661886 |
| NPHS2 | -2.5649582 |
| CDC26 | -2.5647044 |
| CCDC91 | -2.5646253 |
| ZC4H2 | -2.5645834 |
| PFN1 | -2.5640967 |
| PPP2CB | -2.5632099 |
| ACHE | -2.562719 |
| LMO1 | -2.562321 |
| TMEM141 | -2.5617051 |
| NAPSB | -2.5586997 |
| ABTB1 | -2.558554 |
| STEAP2 | -2.5571628 |
| OCEL1 | -2.5570403 |
| PSMC2 | -2.5567874 |
| MYBBP1A | -2.5557077 |
| OR2W3 | -2.5547983 |
| EIF3A | -2.5546006 |
| TTC39A | -2.5543505 |
| KRR1 | -2.5534962 |
| TOMM40L | -2.5527767 |
| PGAM1P5 | -2.5526289 |
| LALBA | -2.5525236 |
| NDUFB2 | -2.5520427 |
| TMEM14B | -2.5501817 |
| SYNJ1 | -2.5493331 |

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| C2orf69 | -2.5482566 |
| MRPS28 | -2.5480501 |
| NANOS3 | -2.5473365 |
| SMS | -2.5471948 |
| TAF4B | -2.5468145 |
| SHD | -2.5466571 |
| CHAC1 | -2.546512 |
| SNX3 | -2.5446162 |
| SLC4A1AP | -2.5435582 |
| VPS13A | -2.5426343 |
| MYEF2 | -2.5413768 |
| CYP1B1-AS1 | -2.5412827 |
| CDR2 | -2.5405092 |
| ENTPD6 | -2.5395428 |
| RAB42 | -2.5390372 |
| AKAP12 | -2.5380503 |
| OPN4 | -2.5376786 |
| ZFP91 | -2.5373217 |
| PPIL3 | -2.5365304 |
| AQP2 | -2.536469 |
| OR10H5 | -2.5364018 |
| WDR41 | -2.5363866 |
| DVL1 | -2.5362119 |
| SPRR2E | -2.535224 |
| DCTN1 | -2.5341129 |
| NLRC5 | -2.5341045 |
| EPHA3 | -2.5338038 |
| FBXW7 | -2.5334906 |
| GNA15 | -2.5324698 |
| RARB | -2.531893 |
| SLC25A46 | -2.5317661 |
| FIBP | -2.5317024 |
| C8orf33 | -2.5312157 |
| C1orf158 | -2.5304941 |
| MALSU1 | -2.5299868 |
| APOOL | -2.5297531 |
| ATCAY | -2.5284561 |
| GDF7 | -2.5276145 |
| OR4D10 | -2.5272106 |
| TRMT12 | -2.5267569 |
| COQ10A | -2.5263452 |
| CHMP4C | -2.526281 |

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| LRRC15 | -2.5259993 |
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| MTO1 | -2.5241246 |
| PCDHAC2 | -2.5236821 |
| MDH2 | -2.5228979 |
| ZNF582 | -2.5221604 |
| SLC6A13 | -2.5216393 |
| NKX2-3 | -2.5208598 |
| RALBP1 | -2.5201691 |
| GGCT | -2.5191475 |
| HMG20A | -2.5191016 |
| ACTR6 | -2.5167339 |
| ARPC5L | -2.5161856 |
| SEH1L | -2.515748 |
| NDUFS6 | -2.5150187 |
| CTNNBIP1 | -2.5146357 |
| MCF2L2 | -2.5130667 |
| CACNB1 | -2.5125411 |
| NDUFA6 | -2.5122025 |
| TAF6 | -2.512187 |
| CIDEC | -2.5120141 |
| OXNAD1 | -2.5115627 |
| ZSCAN5A | -2.5114533 |
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| HPRT1 | -2.5097577 |
| H1FNT | -2.5083273 |
| NDUFB4 | -2.5071608 |
| IMP3 | -2.5070751 |
| MKKS | -2.5066575 |
| THUMPD2 | -2.5065912 |
| MEX3D | -2.5061434 |
| CTSK | -2.5043467 |
| HCRT | -2.5043342 |
| GDF10 | -2.5040214 |
| PLA2G5 | -2.5038494 |
| DOPEY2 | -2.5035742 |
| KCNAB1 | -2.50219 |
| RAPGEF1 | -2.5011066 |
| GRPEL2 | -2.4997267 |
| LY9 | -2.4992676 |
| BRK1 | -2.4988563 |
| ATG16L2 | -2.4984735 |
| SCN2B | -2.4976452 |

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| SLAMF9 | -2.4957508 |
| DYDC2 | -2.4927855 |
| GNB1 | -2.4922636 |
| CAMK4 | -2.4919338 |
| TRAF3IP1 | -2.4914162 |
| PIH1D1 | -2.4912981 |
| EEF1B2 | -2.4909193 |
| ALOX5AP | -2.4897621 |
| SYAP1 | -2.4890887 |
| EIF4E1B | -2.4888188 |
| SUSD3 | -2.4870549 |
| FBXW2 | -2.4858543 |
| DNAJC18 | -2.4846971 |
| PI4KA | -2.4838714 |
| ELP3 | -2.4837308 |
| EN2 | -2.4835492 |
| SENP2 | -2.4833341 |
| LDHA | -2.4829614 |
| HNRNPD | -2.4828908 |
| OR5V1 | -2.4825414 |
| PLA2G7 | -2.4822932 |
| UBE3A | -2.4822572 |
| GBA2 | -2.4817666 |
| RAB4A | -2.4806329 |
| APBB1IP | -2.4797377 |
| FSTL4 | -2.4795916 |
| OR2H1 | -2.4793292 |
| PREP | -2.4784388 |
| GLRB | -2.4784239 |
| MRPS14 | -2.4779189 |
| AGTPBP1 | -2.4773223 |

**Table 5 GO terms enriched in the top 10% of genes positively associated with cortical volume in preHD**

| GO Term | Description | P value |
|---|---|---|
| GO:0032501 | multicellular organismal process | 1.21E-27 |
| GO:0048513 | animal organ development | 2.17E-27 |
| GO:0048856 | anatomical structure development | 2.07E-26 |
| GO:0007275 | multicellular organism development | 5.51E-26 |
| GO:0009653 | anatomical structure morphogenesis | 2.83E-25 |
| GO:0032502 | developmental process | 3.87E-25 |
| GO:0048731 | system development | 1.24E-24 |
| GO:0009888 | tissue development | 1.05E-23 |
| GO:0009887 | animal organ morphogenesis | 4.94E-23 |
| GO:0072359 | circulatory system development | 7.56E-20 |
| GO:0050896 | response to stimulus | 1.76E-18 |
| GO:0065007 | biological regulation | 2.52E-16 |
| GO:0048646 | anatomical structure formation involved in morphogenesis | 3.84E-16 |
| GO:0060429 | epithelium development | 1.55E-15 |
| GO:0048869 | cellular developmental process | 2.14E-15 |
| GO:0030154 | cell differentiation | 2.47E-15 |
| GO:0007154 | cell communication | 6.77E-15 |
| GO:0050794 | regulation of cellular process | 8.51E-15 |
| GO:0023052 | signaling | 1.69E-14 |
| GO:0035295 | tube development | 1.92E-14 |
| GO:0051716 | cellular response to stimulus | 1.28E-13 |
| GO:0007165 | signal transduction | 9.66E-13 |
| GO:0050789 | regulation of biological process | 1.56E-12 |
| GO:0030198 | extracellular matrix organization | 2.50E-12 |
| GO:0043062 | extracellular structure organization | 2.78E-12 |
| GO:0045229 | external encapsulating structure organization | 3.44E-12 |
| GO:0001944 | vasculature development | 3.96E-12 |
| GO:0035239 | tube morphogenesis | 4.24E-12 |
| GO:0016477 | cell migration | 5.54E-12 |
| GO:0001568 | blood vessel development | 6.94E-12 |
| GO:0050793 | regulation of developmental process | 7.59E-12 |
| GO:0009790 | embryo development | 1.20E-11 |
| GO:0008283 | cell population proliferation | 1.83E-11 |
| GO:0030855 | epithelial cell differentiation | 4.68E-11 |
| GO:0042127 | regulation of cell population proliferation | 1.19E-10 |
| GO:0007507 | heart development | 1.91E-10 |
| GO:0007166 | cell surface receptor signaling pathway | 2.50E-10 |
| GO:0061061 | muscle structure development | 3.28E-10 |
| GO:0051239 | regulation of multicellular organismal process | 4.46E-10 |
| GO:0048514 | blood vessel morphogenesis | 7.02E-10 |

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|---|---|---|
| GO:0048518 | positive regulation of biological process | 9.37E-10 |
| GO:0048729 | tissue morphogenesis | 1.10E-09 |
| GO:0042221 | response to chemical | 1.59E-09 |
| GO:0051674 | localization of cell | 1.67E-09 |
| GO:0048870 | cell motility | 1.67E-09 |
| GO:0001655 | urogenital system development | 3.25E-09 |
| GO:0003007 | heart morphogenesis | 1.07E-08 |
| GO:0048522 | positive regulation of cellular process | 1.37E-08 |
| GO:0048523 | negative regulation of cellular process | 2.06E-08 |
| GO:0003013 | circulatory system process | 6.99E-08 |
| GO:0007155 | cell adhesion | 8.15E-08 |
| GO:0065008 | regulation of biological quality | 8.86E-08 |
| GO:0030334 | regulation of cell migration | 8.88E-08 |
| GO:0009605 | response to external stimulus | 1.10E-07 |
| GO:0040011 | locomotion | 1.14E-07 |
| GO:0003018 | vascular process in circulatory system | 1.21E-07 |
| GO:0072001 | renal system development | 1.62E-07 |
| GO:0001822 | kidney development | 3.31E-07 |
| GO:0040012 | regulation of locomotion | 4.12E-07 |
| GO:0010646 | regulation of cell communication | 4.23E-07 |
| GO:2000026 | regulation of multicellular organismal development | 5.80E-07 |
| GO:0040017 | positive regulation of locomotion | 6.23E-07 |
| GO:0048583 | regulation of response to stimulus | 6.80E-07 |
| GO:0048468 | cell development | 9.71E-07 |
| GO:0003008 | system process | 1.08E-06 |
| GO:0007399 | nervous system development | 1.11E-06 |
| GO:0023051 | regulation of signaling | 1.12E-06 |
| GO:2000145 | regulation of cell motility | 1.17E-06 |
| GO:0001525 | angiogenesis | 1.94E-06 |
| GO:0030335 | positive regulation of cell migration | 2.17E-06 |
| GO:0030199 | collagen fibril organization | 3.03E-06 |
| GO:0051270 | regulation of cellular component movement | 3.68E-06 |
| GO:0061448 | connective tissue development | 4.03E-06 |
| GO:0001503 | ossification | 4.09E-06 |
| GO:0001501 | skeletal system development | 4.29E-06 |
| GO:0010033 | response to organic substance | 5.08E-06 |
| GO:0051272 | positive regulation of cellular component movement | 5.64E-06 |
| GO:0070887 | cellular response to chemical stimulus | 6.17E-06 |
| GO:2000147 | positive regulation of cell motility | 8.27E-06 |
| GO:0032879 | regulation of localization | 1.08E-05 |
| GO:0010604 | positive regulation of macromolecule metabolic process | 1.18E-05 |
| GO:0006928 | movement of cell or subcellular component | 1.37E-05 |
| GO:0048568 | embryonic organ development | 1.60E-05 |

| | | |
|---|---|---|
| GO:0051254 | positive regulation of RNA metabolic process | 1.85E-05 |
| GO:0009893 | positive regulation of metabolic process | 2.48E-05 |
| GO:0009966 | regulation of signal transduction | 2.99E-05 |
| GO:0043588 | skin development | 2.99E-05 |
| GO:0007204 | positive regulation of cytosolic calcium ion concentration | 3.07E-05 |
| GO:0002009 | morphogenesis of an epithelium | 4.13E-05 |
| GO:1902680 | positive regulation of RNA biosynthetic process | 4.70E-05 |
| GO:0048519 | negative regulation of biological process | 5.00E-05 |
| GO:0008284 | positive regulation of cell population proliferation | 5.13E-05 |
| GO:0072132 | mesenchyme morphogenesis | 5.35E-05 |
| GO:0003170 | heart valve development | 5.40E-05 |
| GO:0009792 | embryo development ending in birth or egg hatching | 5.70E-05 |
| GO:0007423 | sensory organ development | 5.75E-05 |
| GO:0043009 | chordate embryonic development | 6.11E-05 |
| GO:0048598 | embryonic morphogenesis | 6.30E-05 |
| GO:0003179 | heart valve morphogenesis | 6.68E-05 |
| GO:0045944 | positive regulation of transcription by RNA polymerase II | 6.98E-05 |
| GO:0072006 | nephron development | 7.48E-05 |
| GO:0045893 | positive regulation of transcription, DNA-templated | 8.28E-05 |
| GO:1903508 | positive regulation of nucleic acid-templated transcription | 8.28E-05 |
| GO:0031328 | positive regulation of cellular biosynthetic process | 8.37E-05 |
| GO:0006950 | response to stress | 9.69E-05 |
| GO:0009891 | positive regulation of biosynthetic process | 9.99E-05 |
| GO:0051093 | negative regulation of developmental process | 0.00011 |
| GO:0051240 | positive regulation of multicellular organismal process | 0.000112 |
| GO:2001236 | regulation of extrinsic apoptotic signaling pathway | 0.000129 |
| GO:0045446 | endothelial cell differentiation | 0.000136 |
| GO:0010647 | positive regulation of cell communication | 0.000144 |
| GO:0045595 | regulation of cell differentiation | 0.000148 |
| GO:0042592 | homeostatic process | 0.000149 |
| GO:0023056 | positive regulation of signaling | 0.00016 |
| GO:0060537 | muscle tissue development | 0.000174 |
| GO:0003158 | endothelium development | 0.000189 |
| GO:0010557 | positive regulation of macromolecule biosynthetic process | 0.00019 |
| GO:0008015 | blood circulation | 0.000205 |
| GO:0045935 | positive regulation of nucleobase-containing compound metabolic process | 0.000219 |
| GO:0072009 | nephron epithelium development | 0.000259 |
| GO:0050673 | epithelial cell proliferation | 0.000275 |
| GO:0042692 | muscle cell differentiation | 0.000287 |
| GO:0034329 | cell junction assembly | 0.000296 |
| GO:0051094 | positive regulation of developmental process | 0.000398 |
| GO:0009968 | negative regulation of signal transduction | 0.000411 |
| GO:0051216 | cartilage development | 0.000445 |

| | | |
|---|---|---|
| GO:0031325 | positive regulation of cellular metabolic process | 0.000494 |
| GO:0060485 | mesenchyme development | 0.000568 |
| GO:0051241 | negative regulation of multicellular organismal process | 0.000613 |
| GO:0001667 | ameboidal-type cell migration | 0.000665 |
| GO:0048584 | positive regulation of response to stimulus | 0.000705 |
| GO:0022008 | neurogenesis | 0.000798 |
| GO:0001570 | vasculogenesis | 0.000821 |
| GO:0085029 | extracellular matrix assembly | 0.000997 |
| GO:0048585 | negative regulation of response to stimulus | 0.001069 |
| GO:0071310 | cellular response to organic substance | 0.001075 |
| GO:0033002 | muscle cell proliferation | 0.001162 |
| GO:0072073 | kidney epithelium development | 0.001204 |
| GO:0071363 | cellular response to growth factor stimulus | 0.001258 |
| GO:0060840 | artery development | 0.001459 |
| GO:0006935 | chemotaxis | 0.001516 |
| GO:0042330 | taxis | 0.001646 |
| GO:0035850 | epithelial cell differentiation involved in kidney development | 0.001865 |
| GO:1901888 | regulation of cell junction assembly | 0.002051 |
| GO:0048771 | tissue remodeling | 0.002214 |
| GO:0007517 | muscle organ development | 0.002361 |
| GO:0045216 | cell-cell junction organization | 0.002594 |
| GO:0050678 | regulation of epithelial cell proliferation | 0.002646 |
| GO:0009719 | response to endogenous stimulus | 0.002872 |
| GO:0097191 | extrinsic apoptotic signaling pathway | 0.002945 |
| GO:0032101 | regulation of response to external stimulus | 0.003143 |
| GO:0050900 | leukocyte migration | 0.003153 |
| GO:0080090 | regulation of primary metabolic process | 0.003378 |
| GO:0022603 | regulation of anatomical structure morphogenesis | 0.003721 |
| GO:0051173 | positive regulation of nitrogen compound metabolic process | 0.003722 |
| GO:0035296 | regulation of tube diameter | 0.003998 |
| GO:0097746 | blood vessel diameter maintenance | 0.003998 |
| GO:0070848 | response to growth factor | 0.004006 |
| GO:0040007 | growth | 0.004156 |
| GO:0007186 | G protein-coupled receptor signaling pathway | 0.00423 |
| GO:1903596 | regulation of gap junction assembly | 0.004349 |
| GO:0035150 | regulation of tube size | 0.004399 |
| GO:0023057 | negative regulation of signaling | 0.004405 |
| GO:0003206 | cardiac chamber morphogenesis | 0.004475 |
| GO:0007267 | cell-cell signaling | 0.00469 |
| GO:0048863 | stem cell differentiation | 0.005195 |
| GO:0060562 | epithelial tube morphogenesis | 0.005385 |
| GO:0080134 | regulation of response to stress | 0.005691 |
| GO:0048738 | cardiac muscle tissue development | 0.006341 |

| | | |
|---|---|---|
| GO:0009967 | positive regulation of signal transduction | 0.007231 |
| GO:0010648 | negative regulation of cell communication | 0.007689 |
| GO:0048844 | artery morphogenesis | 0.008075 |
| GO:0007043 | cell-cell junction assembly | 0.009161 |
| GO:0065009 | regulation of molecular function | 0.009873 |
| GO:0048562 | embryonic organ morphogenesis | 0.010144 |
| GO:0008285 | negative regulation of cell population proliferation | 0.010926 |
| GO:0031323 | regulation of cellular metabolic process | 0.010946 |
| GO:0061005 | cell differentiation involved in kidney development | 0.011095 |
| GO:0030182 | neuron differentiation | 0.011118 |
| GO:0003197 | endocardial cushion development | 0.011632 |
| GO:0034330 | cell junction organization | 0.01192 |
| GO:0002064 | epithelial cell development | 0.012683 |
| GO:0001935 | endothelial cell proliferation | 0.01296 |
| GO:0009612 | response to mechanical stimulus | 0.014595 |
| GO:0048660 | regulation of smooth muscle cell proliferation | 0.01561 |
| GO:0003171 | atrioventricular valve development | 0.015818 |
| GO:0051146 | striated muscle cell differentiation | 0.015887 |
| GO:0014706 | striated muscle tissue development | 0.01762 |
| GO:0007389 | pattern specification process | 0.018105 |
| GO:0009611 | response to wounding | 0.018108 |
| GO:0003012 | muscle system process | 0.019098 |
| GO:1903598 | positive regulation of gap junction assembly | 0.019597 |
| GO:0048880 | sensory system development | 0.020252 |
| GO:0042981 | regulation of apoptotic process | 0.020331 |
| GO:0003272 | endocardial cushion formation | 0.020585 |
| GO:0003151 | outflow tract morphogenesis | 0.020904 |
| GO:0043067 | regulation of programmed cell death | 0.020927 |
| GO:0042063 | gliogenesis | 0.021828 |
| GO:2001233 | regulation of apoptotic signaling pathway | 0.022152 |
| GO:0098609 | cell-cell adhesion | 0.022765 |
| GO:0048659 | smooth muscle cell proliferation | 0.024207 |
| GO:0055001 | muscle cell development | 0.024724 |
| GO:0048589 | developmental growth | 0.025136 |
| GO:0045597 | positive regulation of cell differentiation | 0.025823 |
| GO:0003231 | cardiac ventricle development | 0.026538 |
| GO:0031324 | negative regulation of cellular metabolic process | 0.027618 |
| GO:0048699 | generation of neurons | 0.029955 |
| GO:0032835 | glomerulus development | 0.031272 |
| GO:0060993 | kidney morphogenesis | 0.033595 |
| GO:0051179 | localization | 0.034515 |
| GO:0010001 | glial cell differentiation | 0.034754 |
| GO:0001654 | eye development | 0.035581 |

| | | |
|---|---|---|
| GO:0048608 | reproductive structure development | 0.036926 |
| GO:2001237 | negative regulation of extrinsic apoptotic signaling pathway | 0.037381 |
| GO:0009889 | regulation of biosynthetic process | 0.039225 |
| GO:0006954 | inflammatory response | 0.040227 |
| GO:0031326 | regulation of cellular biosynthetic process | 0.041333 |
| GO:0010941 | regulation of cell death | 0.041803 |
| GO:0061458 | reproductive system development | 0.041942 |
| GO:0001701 | in utero embryonic development | 0.042643 |
| GO:0150063 | visual system development | 0.042643 |
| GO:0051171 | regulation of nitrogen compound metabolic process | 0.043863 |
| GO:0071495 | cellular response to endogenous stimulus | 0.045963 |
| GO:0003205 | cardiac chamber development | 0.046208 |

**Table 6 GO terms enriched in the top 10% of genes negatively associated with cortical volume in preHD**

| GO Term | Description | P value |
|---|---|---|
| GO:0044260 | cellular macromolecule metabolic process | 2.06E-06 |
| GO:1901564 | organonitrogen compound metabolic process | 1.38E-05 |
| GO:0019538 | protein metabolic process | 8.52E-05 |
| GO:0044267 | cellular protein metabolic process | 9.96E-05 |
| GO:0006793 | phosphorus metabolic process | 0.00037327 |
| GO:0006796 | phosphate-containing compound metabolic process | 0.00044584 |
| GO:0043412 | macromolecule modification | 0.00119709 |
| GO:0099536 | synaptic signaling | 0.00272483 |
| GO:0006470 | protein dephosphorylation | 0.00302114 |
| GO:0048167 | regulation of synaptic plasticity | 0.00565147 |
| GO:0036211 | protein modification process | 0.01119971 |
| GO:0006464 | cellular protein modification process | 0.01119971 |
| GO:0007399 | nervous system development | 0.02198707 |
| GO:0050806 | positive regulation of synaptic transmission | 0.02356441 |
| GO:0035335 | peptidyl-tyrosine dephosphorylation | 0.02959106 |
| GO:0007268 | chemical synaptic transmission | 0.03163031 |
| GO:0098916 | anterograde trans-synaptic signaling | 0.03163031 |
| GO:0009987 | cellular process | 0.03712352 |
| GO:0099537 | trans-synaptic signaling | 0.04080404 |
| GO:0050804 | modulation of chemical synaptic transmission | 0.04542497 |
| GO:0099177 | regulation of trans-synaptic signaling | 0.04733191 |
| GO:0060291 | long-term synaptic potentiation | 0.04916304 |

**Table 7 GO terms enriched in the top 10% of genes positively associated with cortical mean diffusivity in preHD**

| GO term | Description | P value |
|---|---|---|
| GO:0048856 | anatomical structure development | 1.54E-15 |
| GO:0032502 | developmental process | 2.80E-15 |
| GO:0009888 | tissue development | 1.91E-14 |
| GO:0007275 | multicellular organism development | 1.96E-14 |
| GO:0048731 | system development | 9.88E-14 |
| GO:0032501 | multicellular organismal process | 3.54E-13 |
| GO:0035295 | tube development | 4.26E-13 |
| GO:0009653 | anatomical structure morphogenesis | 7.51E-13 |
| GO:0048513 | animal organ development | 1.44E-12 |
| GO:0007166 | cell surface receptor signaling pathway | 2.12E-10 |
| GO:0072359 | circulatory system development | 6.14E-10 |
| GO:0050896 | response to stimulus | 3.93E-09 |
| GO:0001655 | urogenital system development | 7.86E-09 |
| GO:0060429 | epithelium development | 8.92E-09 |
| GO:0009887 | animal organ morphogenesis | 1.22E-08 |
| GO:0048729 | tissue morphogenesis | 1.34E-08 |
| GO:0035239 | tube morphogenesis | 1.59E-08 |
| GO:0048869 | cellular developmental process | 8.25E-08 |
| GO:0048646 | anatomical structure formation involved in morphogenesis | 8.64E-08 |
| GO:0051716 | cellular response to stimulus | 1.05E-07 |
| GO:0072001 | renal system development | 1.18E-07 |
| GO:0030154 | cell differentiation | 1.32E-07 |
| GO:0001568 | blood vessel development | 1.68E-07 |
| GO:0007154 | cell communication | 1.77E-07 |
| GO:0007165 | signal transduction | 3.53E-07 |
| GO:0001822 | kidney development | 3.92E-07 |
| GO:0023052 | signaling | 3.97E-07 |
| GO:0001944 | vasculature development | 5.54E-07 |
| GO:0030198 | extracellular matrix organization | 1.84E-06 |
| GO:0003012 | muscle system process | 1.91E-06 |
| GO:0043062 | extracellular structure organization | 1.95E-06 |
| GO:0045229 | external encapsulating structure organization | 2.19E-06 |
| GO:0050793 | regulation of developmental process | 3.51E-06 |
| GO:0061061 | muscle structure development | 7.71E-06 |
| GO:0042221 | response to chemical | 1.63E-05 |
| GO:0051239 | regulation of multicellular organismal process | 1.66E-05 |
| GO:0002009 | morphogenesis of an epithelium | 1.67E-05 |
| GO:0048514 | blood vessel morphogenesis | 2.20E-05 |
| GO:0048468 | cell development | 2.64E-05 |
| GO:0008283 | cell population proliferation | 3.13E-05 |

| | | |
|---|---|---:|
| GO:0003013 | circulatory system process | 3.19E-05 |
| GO:0042127 | regulation of cell population proliferation | 5.79E-05 |
| GO:0048598 | embryonic morphogenesis | 7.12E-05 |
| GO:0007507 | heart development | 7.50E-05 |
| GO:0006936 | muscle contraction | 8.38E-05 |
| GO:0032835 | glomerulus development | 9.26E-05 |
| GO:0072006 | nephron development | 9.28E-05 |
| GO:0009790 | embryo development | 0.00012768 |
| GO:0010646 | regulation of cell communication | 0.0001412 |
| GO:0023051 | regulation of signaling | 0.00017321 |
| GO:0060485 | mesenchyme development | 0.00018622 |
| GO:0007155 | cell adhesion | 0.00020835 |
| GO:0060537 | muscle tissue development | 0.00023428 |
| GO:0040011 | locomotion | 0.00026759 |
| GO:0050794 | regulation of cellular process | 0.00026773 |
| GO:0048523 | negative regulation of cellular process | 0.00027189 |
| GO:0016477 | cell migration | 0.00030187 |
| GO:0048870 | cell motility | 0.00034446 |
| GO:0051674 | localization of cell | 0.00034446 |
| GO:0065007 | biological regulation | 0.00044841 |
| GO:0050789 | regulation of biological process | 0.00051255 |
| GO:0009966 | regulation of signal transduction | 0.00052275 |
| GO:0001525 | angiogenesis | 0.00057047 |
| GO:0070887 | cellular response to chemical stimulus | 0.00067304 |
| GO:0008015 | blood circulation | 0.00106557 |
| GO:0010033 | response to organic substance | 0.00122756 |
| GO:0048583 | regulation of response to stimulus | 0.00123652 |
| GO:0003008 | system process | 0.00148999 |
| GO:0007229 | integrin-mediated signaling pathway | 0.00181874 |
| GO:0051179 | localization | 0.00193381 |
| GO:0003007 | heart morphogenesis | 0.00250094 |
| GO:0030199 | collagen fibril organization | 0.0026993 |
| GO:0048518 | positive regulation of biological process | 0.00271073 |
| GO:0051240 | positive regulation of multicellular organismal process | 0.00275833 |
| GO:0030334 | regulation of cell migration | 0.00276568 |
| GO:0072073 | kidney epithelium development | 0.0031418 |
| GO:0006928 | movement of cell or subcellular component | 0.00339396 |
| GO:0072010 | glomerular epithelium development | 0.00381435 |
| GO:0065008 | regulation of biological quality | 0.00389224 |
| GO:2000145 | regulation of cell motility | 0.0040321 |
| GO:0051094 | positive regulation of developmental process | 0.00413195 |
| GO:0048762 | mesenchymal cell differentiation | 0.00507172 |
| GO:0030855 | epithelial cell differentiation | 0.00553363 |

| | | |
|---|---|---|
| GO:0007399 | nervous system development | 0.00560258 |
| GO:0009968 | negative regulation of signal transduction | 0.00627865 |
| GO:2000026 | regulation of multicellular organismal development | 0.00736681 |
| GO:0051270 | regulation of cellular component movement | 0.00818478 |
| GO:0010648 | negative regulation of cell communication | 0.0082309 |
| GO:0023057 | negative regulation of signaling | 0.00902192 |
| GO:0048585 | negative regulation of response to stimulus | 0.00932869 |
| GO:0048568 | embryonic organ development | 0.00972402 |
| GO:0040012 | regulation of locomotion | 0.0109862 |
| GO:0010604 | positive regulation of macromolecule metabolic process | 0.0109979 |
| GO:0098609 | cell-cell adhesion | 0.01216966 |
| GO:0072009 | nephron epithelium development | 0.01602324 |
| GO:0032989 | cellular component morphogenesis | 0.01810838 |
| GO:0014706 | striated muscle tissue development | 0.0190118 |
| GO:0060562 | epithelial tube morphogenesis | 0.02034281 |
| GO:0042592 | homeostatic process | 0.02420401 |
| GO:0001704 | formation of primary germ layer | 0.02720685 |
| GO:0071310 | cellular response to organic substance | 0.02762537 |
| GO:0071560 | cellular response to transforming growth factor beta stimulus | 0.02935797 |
| GO:0030030 | cell projection organization | 0.03114395 |
| GO:0071363 | cellular response to growth factor stimulus | 0.03323373 |
| GO:0009605 | response to external stimulus | 0.03475315 |
| GO:0120036 | plasma membrane bounded cell projection organization | 0.03617613 |
| GO:0035556 | intracellular signal transduction | 0.0367133 |
| GO:0071559 | response to transforming growth factor beta | 0.0387638 |
| GO:0048738 | cardiac muscle tissue development | 0.04269535 |
| GO:0022603 | regulation of anatomical structure morphogenesis | 0.04573249 |
| GO:0045595 | regulation of cell differentiation | 0.04629331 |
| GO:0003015 | heart process | 0.04642439 |
| GO:0009893 | positive regulation of metabolic process | 0.04878945 |

**Table 8 GO terms enriched in the top 10% of genes negatively associated with cortical mean diffusivity in preHD**

| GO Term | Description | P value |
|---|---|---|
| GO:0045333 | cellular respiration | 1.26E-14 |
| GO:0007005 | mitochondrion organization | 2.54E-14 |
| GO:0042775 | mitochondrial ATP synthesis coupled electron transport | 1.93E-13 |
| GO:0042773 | ATP synthesis coupled electron transport | 1.93E-13 |
| GO:0015980 | energy derivation by oxidation of organic compounds | 4.21E-13 |
| GO:0022904 | respiratory electron transport chain | 1.01E-12 |
| GO:0009060 | aerobic respiration | 1.03E-12 |
| GO:0019646 | aerobic electron transport chain | 1.64E-10 |
| GO:0006119 | oxidative phosphorylation | 2.14E-10 |
| GO:0022900 | electron transport chain | 3.81E-10 |
| GO:0006091 | generation of precursor metabolites and energy | 2.18E-09 |
| GO:0046034 | ATP metabolic process | 6.38E-07 |
| GO:0006996 | organelle organization | 1.59E-05 |
| GO:0006120 | mitochondrial electron transport, NADH to ubiquinone | 2.48E-05 |
| GO:0006626 | protein targeting to mitochondrion | 5.64E-05 |
| GO:0044260 | cellular macromolecule metabolic process | 9.04E-05 |
| GO:0044267 | cellular protein metabolic process | 0.0001117 |
| GO:0050794 | regulation of cellular process | 0.0001357 |
| GO:0070585 | protein localization to mitochondrion | 0.00016914 |
| GO:0019538 | protein metabolic process | 0.00017657 |
| GO:1901564 | organonitrogen compound metabolic process | 0.00018942 |
| GO:0072655 | establishment of protein localization to mitochondrion | 0.00040569 |
| GO:0006839 | mitochondrial transport | 0.00062639 |
| GO:0044248 | cellular catabolic process | 0.00071445 |
| GO:0044257 | cellular protein catabolic process | 0.00112269 |
| GO:0051603 | proteolysis involved in cellular protein catabolic process | 0.00218027 |
| GO:0030163 | protein catabolic process | 0.0046225 |
| GO:0009987 | cellular process | 0.00507333 |
| GO:0009057 | macromolecule catabolic process | 0.00520806 |
| GO:0007399 | nervous system development | 0.00592441 |
| GO:0098662 | inorganic cation transmembrane transport | 0.00805982 |
| GO:0044265 | cellular macromolecule catabolic process | 0.01069508 |
| GO:0010257 | NADH dehydrogenase complex assembly | 0.01106478 |
| GO:0032981 | mitochondrial respiratory chain complex I assembly | 0.01106478 |
| GO:0022411 | cellular component disassembly | 0.01165835 |
| GO:0098937 | anterograde dendritic transport | 0.01361016 |
| GO:0009056 | catabolic process | 0.01593881 |
| GO:0098655 | cation transmembrane transport | 0.01699261 |
| GO:0033108 | mitochondrial respiratory chain complex assembly | 0.01876829 |
| GO:1901565 | organonitrogen compound catabolic process | 0.02222081 |

| | | |
|---|---|---|
| GO:0098660 | inorganic ion transmembrane transport | 0.02463497 |
| GO:0007275 | multicellular organism development | 0.02524858 |
| GO:0043043 | peptide biosynthetic process | 0.0306083 |
| GO:0048731 | system development | 0.03217434 |
| GO:0033043 | regulation of organelle organization | 0.03999818 |
| GO:0006511 | ubiquitin-dependent protein catabolic process | 0.04714753 |
| GO:0006413 | translational initiation | 0.04913717 |

**Table 9 List of genes involved in neurodevelopment**

| Gene |
|---|
| CYP26A1 |
| TM6SF1 |
| OSTN |
| TSHZ3 |
| SSX2IP |
| FBXW7 |
| SATB2 |
| PART1 |
| MCHR2 |
| RORB |

**Figure 5 Principal component analysis of developmental genes expression in the AHBA**

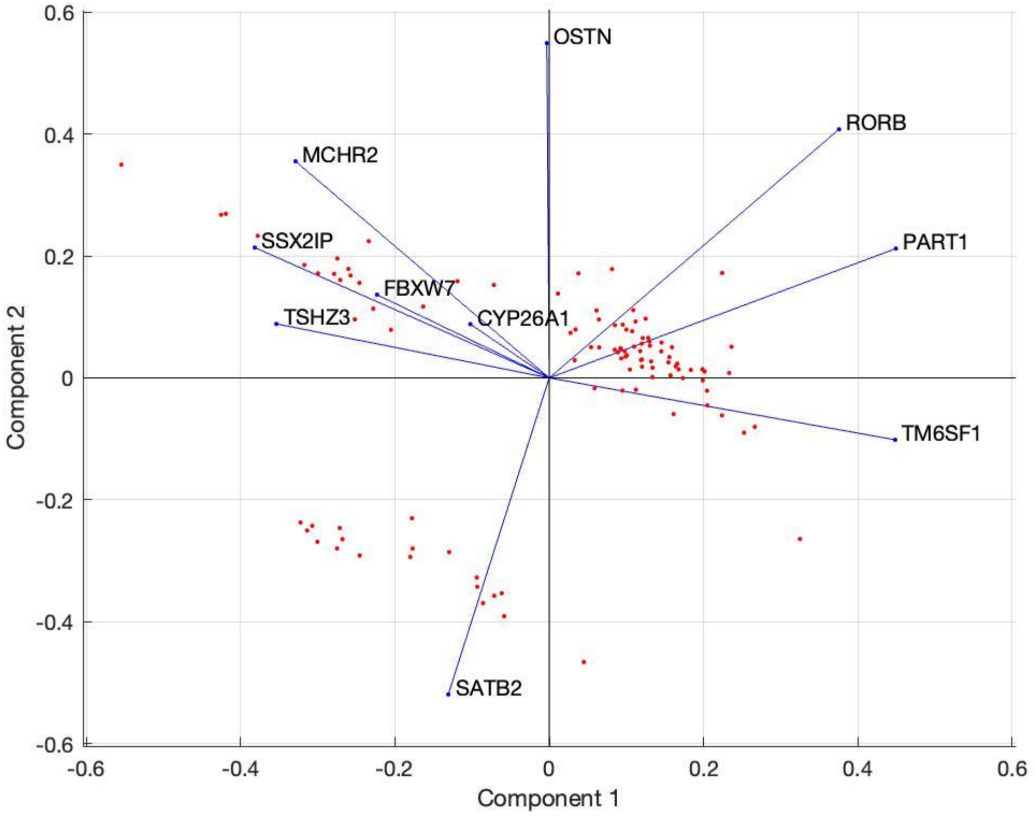

**Table 10 EWCE analysis showing cell types enriched within 10%, 20% and 30% genes positively associated with cortical volume loss using the AIBS single-cell transcription and the DroNC datasets**

| AIBS | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.353909108 | 8.299110199 |
| Endothelial cell | 1 | 0 | 1.516799804 | 9.576170262 |
| GABAergic | 1 | 1 | 0.738534785 | -6.922914949 |
| Glutamatergic | 1 | 1 | 0.733600131 | -6.578371223 |
| Microglia | 1 | 1 | 0.793471878 | -4.19261074 |
| Non-neuronal:Pericyte | 1 | 0.75432 | 0.960598342 | -0.691413515 |
| Non-neuronal:VLMC | 1 | 4.00E-05 | 1.279232786 | 4.13019496 |
| Oligodendrocyte | 1 | 1 | 0.721085153 | -6.200361951 |
| OPC | 1 | 0.18284 | 1.036696015 | 0.898520698 |

| DroNC | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.34645276 | 7.681571894 |
| END | 1 | 0 | 1.63841465 | 11.89567123 |
| exCA | 1 | 1 | 0.59021204 | -13.32384462 |
| exDG | 1 | 1 | 0.63269777 | -10.87461207 |
| exPFC | 1 | 1 | 0.50059859 | -16.41763955 |
| GABA | 1 | 1 | 0.61327637 | -11.19780563 |
| MG | 1 | 0.99708 | 0.80969043 | -2.52350314 |
| NSC | 1 | 0 | 1.24142342 | 5.060028977 |
| ODC | 1 | 1 | 0.54955331 | -7.749730421 |
| OPC | 1 | 0.60126 | 0.98525926 | -0.284731918 |

| AIBS | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.387954424 | 13.04986428 |
| Endothelial cell | 1 | 0 | 1.42041461 | 11.22947896 |
| GABAergic | 1 | 1 | 0.804449293 | -7.379729741 |
| Glutamatergic | 1 | 1 | 0.745769084 | -8.921126631 |
| Microglia | 1 | 0.9908 | 0.920356912 | -2.316692336 |
| Non-neuronal:Pericyte | 1 | 0.37204 | 1.012548585 | 0.31840569 |
| Non-neuronal:VLMC | 1 | 3.00E-05 | 1.189860721 | 4.037591027 |
| Oligodendrocyte | 1 | 1 | 0.757901865 | -7.6506672 |

| DroNC | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.39472975 | 12.59563621 |
| END | 1 | 0 | 1.51561549 | 13.85855906 |
| exCA | 1 | 1 | 0.66361888 | -15.60647869 |
| exDG | 1 | 1 | 0.69890548 | -12.6708484 |
| exPFC | 1 | 1 | 0.58189481 | -19.59729137 |
| GABA | 1 | 1 | 0.69691564 | -12.60090874 |
| MG | 1 | 0.97035 | 0.9039518 | -1.828687166 |
| NSC | 1 | 0 | 1.20454417 | 6.140533943 |

| | | | | |
|---|---|---|---|---|
| OPC | 1 | 0.00085 | 1.090628268 | 3.200649174 |

| AIBS | | | | |
|---|---|---|---|---|
| 30% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.397611942 | 16.44271812 |
| Endothelial cell | 1 | 0 | 1.380912729 | 12.62480903 |
| GABAergic | 1 | 1 | 0.866094523 | -6.238653073 |
| Glutamatergic | 1 | 1 | 0.806798537 | -8.371260052 |
| Microglia | 1 | 0.92292 | 0.960600069 | -1.416590753 |
| Non-neuronal:Pericyte | 1 | 0.50275 | 0.999591887 | -0.012771994 |
| Non-neuronal:VLMC | 1 | 0 | 1.188903604 | 5.003602412 |
| Oligodendrocyte | 1 | 1 | 0.837830758 | -6.373554494 |
| OPC | 1 | 1.00E-05 | 1.111423885 | 4.863674521 |

| | | | | |
|---|---|---|---|---|
| ODC | 1 | 1 | 0.66635522 | -8.198536756 |
| OPC | 1 | 0.00303 | 1.10283789 | 2.878642831 |

| DroNC | | | | |
|---|---|---|---|---|
| 30% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.37236281 | 14.67029365 |
| END | 1 | 0 | 1.45142747 | 15.0131092 |
| exCA | 1 | 1 | 0.74458737 | -14.53057985 |
| exDG | 1 | 1 | 0.77876976 | -11.49078209 |
| exPFC | 1 | 1 | 0.67553844 | -18.55366635 |
| GABA | 1 | 1 | 0.76399753 | -12.07368668 |
| MG | 1 | 0.90296 | 0.94604369 | -1.284192224 |
| NSC | 1 | 0 | 1.26414476 | 9.796549827 |
| ODC | 1 | 1 | 0.74026644 | -7.93996173 |
| OPC | 1 | 2.00E-05 | 1.12898849 | 4.471730526 |

**Table 11 EWCE analysis showing cell types enriched within 10%, 20% and 30% genes negatively associated with cortical volume loss using the AIBS single-cell transcription and the DroNC datasets**

| AIBS | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 1 | 0.751282621 | -5.727462114 |
| Endothelial cell | 1 | 0.99989 | 0.814581303 | -3.418780092 |
| GABAergic | 1 | 0 | 1.289338014 | 7.52885599 |
| Glutamatergic | 1 | 0 | 1.528554718 | 12.80936116 |
| Microglia | 1 | 0 | 1.39010846 | 7.758335161 |
| Non-neuronal:Pericyte | 1 | 0.69644 | 0.970273406 | -0.525157437 |
| Non-neuronal:VLMC | 1 | 0.99705 | 0.820174552 | -2.649009422 |
| Oligodendrocyte | 1 | 0.79633 | 0.962076806 | -0.837768296 |
| OPC | 1 | 0.27986 | 1.022792276 | 0.569506242 |

| DroNC | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 1 | 0.80027258 | -4.43213217 |
| END | 1 | 0.99025 | 0.8784664 | -2.249973205 |
| exCA | 1 | 0 | 1.33124654 | 10.64371563 |
| exDG | 1 | 0.00152 | 1.10149167 | 3.005049741 |
| exPFC | 1 | 0 | 1.4859348 | 15.72430639 |
| GABA | 1 | 0 | 1.26624524 | 7.683529119 |
| MG | 1 | 0 | 1.78593381 | 10.1903561 |
| NSC | 1 | 0.99978 | 0.83910096 | -3.310031996 |
| ODC | 1 | 0.99818 | 0.84481744 | -2.678040506 |
| OPC | 1 | 0.39886 | 1.01092488 | 0.223056891 |

| AIBS | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 1 | 0.830369495 | -5.529675154 |
| Endothelial cell | 1 | 0.99573 | 0.901925372 | -2.556392234 |
| GABAergic | 1 | 0 | 1.287058073 | 10.54751146 |
| Glutamatergic | 1 | 0 | 1.466576669 | 15.91557349 |
| Microglia | 1 | 0 | 1.26797107 | 7.626606066 |
| Non-neuronal:Pericyte | 1 | 0.04568 | 1.068445219 | 1.711651528 |
| Non-neuronal:VLMC | 1 | 0.99612 | 0.876675157 | -2.58241197 |
| Oligodendrocyte | 1 | 0.08639 | 1.043813719 | 1.373156167 |
| OPC | 1 | 0.10712 | 1.035487535 | 1.251155892 |

| DroNC | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0.99999 | 0.87785247 | -3.822395923 |
| END | 1 | 0.85363 | 0.96010037 | -1.050318637 |
| exCA | 1 | 0 | 1.32770586 | 14.86269279 |
| exDG | 1 | 0 | 1.19127833 | 7.930293466 |
| exPFC | 1 | 0 | 1.4434611 | 20.16325051 |
| GABA | 1 | 0 | 1.28303969 | 11.51953786 |
| MG | 1 | 0 | 1.49316224 | 9.084451396 |
| NSC | 1 | 0.99899 | 0.8982038 | -2.988945989 |
| ODC | 1 | 0.7016 | 0.97766114 | -0.545631638 |

| | | | | |
|---|---|---|---|---|
| OPC | 1 | 0.05555 | 1.05735533 | 1.627505857 |

**AIBS**

**30%**

| CellType | annotLevel | p | fold_change | sd_from_mean |
|---|---|---|---|---|
| Astrocyte | 1 | 1 | 0.862459871 | -5.540648885 |
| Endothelial cell | 1 | 0.98857 | 0.93147825 | -2.234802747 |
| GABAergic | 1 | 0 | 1.28999972 | 13.11684996 |
| Glutamatergic | 1 | 0 | 1.439123021 | 18.60834023 |
| Microglia | 1 | 0 | 1.25202809 | 8.817074202 |
| Non-neuronal:Pericyte | 1 | 4.00E-05 | 1.127297005 | 3.909686486 |
| Non-neuronal:VLMC | 1 | 0.85138 | 0.959930191 | -1.035120335 |
| Oligodendrocyte | 1 | 0.00324 | 1.071824463 | 2.774391129 |
| OPC | 1 | 0.01531 | 1.050766218 | 2.212861758 |

**DroNC**

**30%**

| CellType | annotLevel | p | fold_change | sd_from_mean |
|---|---|---|---|---|
| ASC | 1 | 0.99966 | 0.91550453 | -3.277818412 |
| END | 1 | 0.40793 | 1.00692061 | 0.226057812 |
| exCA | 1 | 0 | 1.35385033 | 19.5968077 |
| exDG | 1 | 0 | 1.25105204 | 12.79031289 |
| exPFC | 1 | 0 | 1.44168807 | 24.52795228 |
| GABA | 1 | 0 | 1.31477528 | 15.68834141 |
| MG | 1 | 0 | 1.41549192 | 9.56641154 |
| NSC | 1 | 0.96265 | 0.95129317 | -1.755631442 |
| ODC | 1 | 0.2104 | 1.02650222 | 0.797334449 |
| OPC | 1 | 0.0033 | 1.0804842 | 2.825918634 |

**Table 12 EWCE analysis showing cell types enriched within the top 10%, 20% and 30% genes positively associated with increases in cortical mean diffusivity using the AIBS single-cell transcription and the DroNC-seq datasets**

| AIBS | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.35185271 | 5.965243887 |
| Endothelial cell | 1 | 0 | 1.383532471 | 5.15933219 |
| GABAergic | 1 | 1 | 0.764747329 | -4.513687551 |
| Glutamatergic | 1 | 1 | 0.515968606 | -8.687005258 |
| Microglia | 1 | 0.99841 | 0.812427303 | -2.738085156 |
| Non-neuronal:Pericyte | 1 | 0 | 1.597978975 | 7.550388206 |
| Non-neuronal:VLMC | 1 | 1.00E-04 | 1.378132796 | 4.100850647 |
| Oligodendrocyte | 1 | 0.1977 | 1.052620864 | 0.842280753 |
| OPC | 1 | 0.99972 | 0.824903964 | -3.133989023 |

| DroNC | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.57645664 | 9.439619241 |
| END | 1 | 0 | 1.81610879 | 10.95365082 |
| exCA | 1 | 1 | 0.73069223 | -6.486611145 |
| exDG | 1 | 1 | 0.76689478 | -5.093094381 |
| exPFC | 1 | 1 | 0.53267438 | -11.47162131 |
| GABA | 1 | 1 | 0.74671923 | -5.419449608 |
| MG | 1 | 0.14552 | 1.10897559 | 1.057910119 |
| NSC | 1 | 0 | 1.55464919 | 8.412579734 |
| ODC | 1 | 0.00252 | 1.24558354 | 3.068885649 |
| OPC | 1 | 0.13744 | 1.07670855 | 1.095502269 |

| AIBS | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.383944686 | 9.196347063 |
| Endothelial cell | 1 | 0 | 1.435999097 | 8.421329612 |
| GABAergic | 1 | 1 | 0.699324611 | -8.198624807 |
| Glutamatergic | 1 | 1 | 0.509830106 | -12.34887586 |
| Microglia | 1 | 1 | 0.792791074 | -4.346796512 |
| Non-neuronal:Pericyte | 1 | 0 | 1.368420156 | 6.636156394 |
| Non-neuronal:VLMC | 1 | 0 | 1.424895812 | 6.591154791 |
| Oligodendrocyte | 1 | 1.00E-05 | 1.202255847 | 4.623958163 |
| OPC | 1 | 0.86693 | 0.957015424 | -1.112918905 |

| DroNC | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.65282693 | 15.13185926 |
| END | 1 | 0 | 1.76780964 | 14.6942955 |
| exCA | 1 | 1 | 0.75641599 | -8.356195585 |
| exDG | 1 | 1 | 0.79382443 | -6.40723919 |
| exPFC | 1 | 1 | 0.56514223 | -15.02838872 |
| GABA | 1 | 1 | 0.72455623 | -8.456312731 |
| MG | 1 | 0.04684 | 1.12475163 | 1.741140073 |
| NSC | 1 | 0 | 1.56951732 | 12.32739126 |
| ODC | 1 | 0 | 1.56144376 | 10.00644032 |

| | | | | |
|---|---|---|---|---|
| OPC | 1 | 0.00011 | 1.20309904 | 4.199103427 |

| AIBS | | | | |
|---|---|---|---|---|
| 30% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| Astrocyte | 1 | 0 | 1.382850921 | 11.29501202 |
| Endothelial cell | 1 | 0 | 1.396159021 | 9.436970635 |
| GABAergic | 1 | 1 | 0.732107482 | -9.009602607 |
| Glutamatergic | 1 | 1 | 0.555634931 | -13.82158626 |
| Microglia | 1 | 1 | 0.84664604 | -3.952896771 |
| Non-neuronal:Pericyte | 1 | 0 | 1.260689751 | 5.798482975 |
| Non-neuronal:VLMC | 1 | 0 | 1.322314901 | 6.191359495 |
| Oligodendrocyte | 1 | 0 | 1.291017373 | 8.201278822 |
| OPC | 1 | 0.31509 | 1.0149275 | 0.476262662 |

| DroNC | | | | |
|---|---|---|---|---|
| 30% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 0 | 1.61890895 | 17.63355203 |
| END | 1 | 0 | 1.63224827 | 14.92875228 |
| exCA | 1 | 1 | 0.7709615 | -9.620361368 |
| exDG | 1 | 1 | 0.83657619 | -6.229946588 |
| exPFC | 1 | 1 | 0.60183042 | -16.84588449 |
| GABA | 1 | 1 | 0.78075725 | -8.237305915 |
| MG | 1 | 0.00822 | 1.14725194 | 2.524457876 |
| NSC | 1 | 0 | 1.51140068 | 13.63013351 |
| ODC | 1 | 0 | 1.6814185 | 14.93824617 |
| OPC | 1 | 0 | 1.26664328 | 6.808969087 |

**Table 13 EWCE analysis showing cell types enriched within the top 10%, 20% and 30% of genes negatively associated with increases in cortical mean diffusivity in the AIBS single-cell transcription and the DroNC-seq datasets**

| AIBS | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| GABAergic | 1 | 0 | 1.291348408 | 9.489950106 |
| Glutamatergic | 1 | 0 | 1.484499996 | 14.78665385 |
| Non-neuronal:Pericyte | 1 | 0 | 1.219889303 | 4.889603259 |
| Microglia | 1 | 0.00172 | 1.119730932 | 3.021554323 |
| OPC | 1 | 0.46155 | 1.002562658 | 0.08015723 |
| Non-neuronal:VLMC | 1 | 0.97458 | 0.896361968 | -1.916698458 |
| Endothelial cell | 1 | 0.99997 | 0.830357137 | -3.967546737 |
| Astrocyte | 1 | 1 | 0.829573919 | -4.893773863 |
| Oligodendrocyte | 1 | 1 | 0.85369899 | -4.072890172 |

| DroNC | | | | |
|---|---|---|---|---|
| 10% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 1 | 0.819621187 | -5.023391842 |
| END | 1 | 0.92599 | 0.938935174 | -1.427431723 |
| exCA | 1 | 0 | 1.215025304 | 8.618050571 |
| exDG | 1 | 0.00011 | 1.101974239 | 3.727088388 |
| exPFC | 1 | 0 | 1.459022386 | 18.41862579 |
| GABA | 1 | 0 | 1.255920963 | 9.150635384 |
| MG | 1 | 0.00667 | 1.160439131 | 2.599697401 |
| NSC | 1 | 0.98769 | 0.914757235 | -2.191907383 |
| ODC | 1 | 1 | 0.72571792 | -5.866924314 |
| OPC | 1 | 0.86503 | 0.956083392 | -1.098687253 |

| AIBS | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| GABAergic | 1 | 0 | 1.286047401 | 13.101303 |
| Glutamatergic | 1 | 0 | 1.441544817 | 18.95089857 |
| Microglia | 1 | 0 | 1.187823877 | 6.683467061 |
| Non-neuronal:Pericyte | 1 | 0 | 1.158757869 | 4.985545338 |
| OPC | 1 | 0.05471 | 1.036945062 | 1.617121386 |
| Non-neuronal:VLMC | 1 | 0.98864 | 0.914475142 | -2.242078748 |
| Oligodendrocyte | 1 | 0.99568 | 0.933883017 | -2.576048077 |
| Endothelial cell | 1 | 0.99901 | 0.908885166 | -3.000791769 |
| Astrocyte | 1 | 1 | 0.868018044 | -5.379917223 |

| DroNC | | | | |
|---|---|---|---|---|
| 20% | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 1 | 0.84913928 | -5.890438794 |
| END | 1 | 0.71124 | 0.982892451 | -0.566039462 |
| exCA | 1 | 0 | 1.244824011 | 13.64126459 |
| exDG | 1 | 0 | 1.148588791 | 7.645248349 |
| exPFC | 1 | 0 | 1.417845641 | 23.49419983 |
| GABA | 1 | 0 | 1.26250556 | 13.19528713 |
| MG | 1 | 2.00E-05 | 1.19251754 | 4.461603984 |
| NSC | 1 | 0.93793 | 0.957920005 | -1.531726174 |
| ODC | 1 | 1 | 0.806806676 | -5.809776411 |
| OPC | 1 | 0.50095 | 0.999434024 | -0.019834678 |

| **AIBS** | | | | |
|---|---|---|---|---|
| **30%** | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| GABAergic | 1 | 0 | 1.286047401 | 13.101303 |
| Glutamatergic | 1 | 0 | 1.441544817 | 18.95089857 |
| Microglia | 1 | 0 | 1.187823877 | 6.683467061 |
| Non-neuronal:Pericyte | 1 | 0 | 1.158757869 | 4.985545338 |
| OPC | 1 | 0.05471 | 1.036945062 | 1.617121386 |
| Non-neuronal:VLMC | 1 | 0.98864 | 0.914475142 | -2.242078748 |
| Oligodendrocyte | 1 | 0.99568 | 0.933883017 | -2.576048077 |
| Endothelial cell | 1 | 0.99901 | 0.908885166 | -3.000791769 |
| Astrocyte | 1 | 1 | 0.868018044 | -5.379917223 |

| **DroNC** | | | | |
|---|---|---|---|---|
| **30%** | | | | |
| **CellType** | **annotLevel** | **p** | **fold_change** | **sd_from_mean** |
| ASC | 1 | 1 | 0.848994819 | -5.90012364 |
| END | 1 | 0.71285 | 0.982844042 | -0.56726714 |
| exCA | 1 | 0 | 1.24482382 | 13.63889306 |
| exDG | 1 | 0 | 1.148551837 | 7.621712438 |
| exPFC | 1 | 0 | 1.417915372 | 23.45320858 |
| GABA | 1 | 0 | 1.262678434 | 13.18277982 |
| MG | 1 | 3.00E-05 | 1.192544175 | 4.463107473 |
| NSC | 1 | 0.93874 | 0.957970694 | -1.534560019 |
| ODC | 1 | 1 | 0.806811657 | -5.867624034 |
| OPC | 1 | 0.49809 | 0.999504746 | -0.017354254 |