**Supplementary Table 1.** **Summary of genetic variants selected in this study**

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| --- | --- | --- | --- | --- | --- | --- |
| No. | SNP | CHR | Position (Bp) | EA/AA | EA frequency | Related Genetic Loci |
| 1 | rs823118 | 1 | 205723572 | C/T | 0.315 | *NUCKS1* |
| 2 | rs10797576 | 1 | 232664611 | T/C | 0.137 | *SIPA1L2* |
| 3 | rs4653767 | 1 | 226916078 | C/T | 0.315 | *ITPKB* |
| 4 | rs71628662 | 1 | 155359992 | T/C | 0.015 | *GBA/SYT11* |
| 5 | rs6430538 | 2 | 135539967 | T/C | 0.488 | *ACMSD* |
| 6 | rs34043159 | 2 | 102413116 | C/T | 0.352 | *IL1R2* |
| 7 | rs353116 | 2 | 166133632 | T/C | 0.385 | *SCN2A* |
| 8 | rs6808178 | 3 | 28705690 | T/C | 0.378 | *LINC00693* |
| 9 | rs115185635 | 3 | 87520857 | C/G | 0.036 | *CHMP2B* |
| 10 | rs12637471 | 3 | 182762437 | A/G | 0.219 | *MCCC1* |
| 11 | rs4073221 | 3 | 18277488 | G/T | 0.132 | *SATB1* |
| 12 | rs12497850 | 3 | 48748989 | G/T | 0.347 | *IP6K2* |
| 13 | rs34016896 | 3 | 160992864 | C/T | 0.319 | *NMD3* |
| 14 | rs34311866 | 4 | 951947 | C/T | 0.199 | *TMEM175* |
| 15 | rs11724635 | 4 | 15737101 | C/A | 0.437 | *BST1* |
| 16 | rs6812193 | 4 | 77198986 | T/C | 0.398 | *FAM47E/SCARB2* |
| 17 | rs356182 | 4 | 90626111 | G/A | 0.375 | *SNCA* |
| 18 | rs78738012 | 4 | 114360372 | C/T | 0.106 | [*CAMK2D*](https://www.genecards.org/cgi-bin/carddisp.pl?gene=CAMK2D&keywords=rs78738012) |
| 19 | rs11931074 | 4 | 90639515 | G/T | 0.390 | *SNCA* |
| 20 | rs11248051 | 4 | 858332 | C/T | 0.120 | *GAK* |
| 21 | rs11950533 | 5 | 134199105 | A/C | 0.104 | *C5orf24* |
| 22 | rs2694528 | 5 | 60273923 | C/A | 0.115 | *NDUFAF2* |
| 23 | rs12528068 | 6 | 72487762 | T/C | 0.285 | *RIMS1* |
| 24 | rs997368 | 6 | 112243291 | A/G | 0.803 | *FYN* |
| 25 | rs9468199 | 6 | 27681215 | A/G | 0.172 | *ZNF184* |
| 26 | rs199347 | 7 | 23293746 | G/A | 0.368 | *GPNMB* |
| 27 | rs591323 | 8 | 16697091 | A/G | 0.293 | *FGF20* |
| 28 | rs2280104 | 8 | 22525980 | T/C | 0.367 | *SORBS3* |
| 29 | rs13294100 | 9 | 17579690 | T/G | 0.371 | *SH3GL2* |
| 30 | rs10748818 | 10 | 104015279 | A/G | 0.851 | *GBF1* |
| 31 | rs10906923 | 10 | 15569598 | C/A | 0.306 | *FAM171A1* |
| 32 | rs7077361 | 10 | 15561543 | T/C | 0.874 | *ITGA8* |
| 33 | rs3793947 | 11 | 83544472 | A/G | 0.463 | *DLG2* |
| 34 | rs329648 | 11 | 133765367 | T/C | 0.327 | *MIR4697* |
| 35 | rs11610045 | 12 | 133063768 | A/G | 0.485 | *FBRSL1* |
| 36 | rs76904798 | 12 | 40614434 | T/C | 0.132 | *LRRK2* |
| 37 | rs11060180 | 12 | 123303586 | G/A | 0.450 | *OGFOD2* |
| 38 | rs9568188 | 13 | 49927732 | T/C | 0.747 | *CAB39L* |
| 39 | rs4771268 | 13 | 97865021 | T/C | 0.237 | [*MBNL2*](https://www.genecards.org/cgi-bin/carddisp.pl?gene=MBNL2&keywords=rs4771268) |
| 40 | rs12147950 | 14 | 37989270 | T/C | 0·438 | *MIPOL1* |
| 41 | rs11158026 | 14 | 55348869 | T/C | 0.307 | *GCH1* |
| 42 | rs8005172 | 14 | 88472612 | T/C | 0.424 | *GALC* |
| 43 | rs2414739 | 15 | 61994134 | G/A | 0.292 | *VPS13C* |
| 44 | rs14235 | 16 | 31121793 | A/G | 0.397 | *BCKDK/STX1B* |
| 45 | rs11343 | 16 | 19279464 | T/G | 0.454 | *COQ7* |
| 46 | rs4784227 | 16 | 52599188 | T/C | 0.265 | *TOX3* |
| 47 | rs17649553 | 17 | 43994648 | T/C | 0.232 | *MAPT* |
| 48 | rs11868035 | 17 | 17715101 | G/A | 0.298 | *SREBF1-RAI1* |
| 49 | rs12456492 | 18 | 40673380 | G/A | 0.332 | *RIT2* |
| 50 | rs2823357 | 21 | 16914905 | G/A | 0.37 | *USP25* |

Location and related gene (s) for 50 variants selected in this study based on GWAS meta-analysis [8, 9]. Abbreviations: SNP, single nucleotide polymorphism; Chr, chromosome; GWAS, genome-wide association studies; EA/AA=Effective allele/alternate allele

**Supplementary Table 2. Genetic Associations with PD at Baseline\***

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| --- |
| **Hyposmia** |
| SNP | Related Gene | OR (95%CI) | Beta | *P* Value |
| rs353116 | *SCN2A* | 3.08 (1.50-6.32) | 1.12 | 0.002 |
| **RBD** |
| SNP | Related Gene | OR (95%CI) | Beta | *P* Value |
| rs2694528  | *NDUFAF2* | 1.79 (1.09-2.94) | 0.58 | 0.021 |
| rs2823357 | *USP25* | 1.52 (1.13-2.04) | 0.42 | 0.006 |
| **Autonomic dysfunction** |
| SNP | Related Gene | OR (95%CI) | Beta | *P* Value |
| rs4073221 | *SATB1* | 0.62 (0.40-0.96) | -0.48 | 0.034 |
| rs11248051 | *GAK* | 1.80 (1.02-3.20) | 0.59 | 0.043 |
| **Depression** |
| SNP | Related Gene | OR (95%CI) | Beta | *P* Value |
| rs591323 | *FGF20* | 0.66 (0.44-0.99) | -0.41 | 0.034 |
| **Cognitive Impairment** |
| rs12497850 | *IP6K2* | 1.60 (1.14-2.25) | 0.47 | 0.006 |
| rs76904798 | *LRRK2* | 0.50 (0.30-0.83) | -0.70 | 0.007 |
| **Early Onset Age** |
| SNP | Related Gene | OR (95%CI) | Beta | *P* Value |
| rs4653767 | *ITPKB* | 0.66 (0.44-0.98) | -0.42 | 0.042 |
| rs591323 | *FGF20* | 0.59 (0.38-0.90) | -0.53 | 0.014 |
| rs8005172 | *GALC* | 1.50 (1.07-2.11) | 0.41 | 0.020 |

\*: No disease duration difference identified in the groups with or without non-motor symptoms of PD by one-way ANOVA analysis. Abbreviations: SNP, single nucleotide polymorphism; OR, odds ratio