

Supplementary Table 1. GWAS Summary Statistics Data Sources

| Trait | Abbreviation | Discovery Sample Size (N) | Reference (PMID) | Data Availability |
|----------------------|--------------|---------------------------|------------------|---|
| Insomnia | Insomnia | 453,379 | 30804566 | Sleep Disorders Knowledge Portal (http://sleepdisordergenetics.org/informational/data/) |
| Anterior ALPS-index | aALPS | 31,629 | 39823331 | GWAS Catalog (GCST90455543) |
| Middle ALPS-index | mALPS | 31,629 | 39823331 | GWAS Catalog (GCST90455544) |
| Posterior ALPS-index | pALPS | 31,629 | 39823331 | GWAS Catalog (GCST90455545) |
| Total ALPS-index | tALPS | 31,629 | 39823331 | GWAS Catalog (GCST90455546) |
| Left ALPS-index | Left_ALPS | 31,021 | 39805841 | Figshare (https://figshare.com/articles/dataset/GWAS_summary_statistics_for_ALPS-index/25515331) and GWAS Catalog (GCP001081) |
| Mean ALPS-index | Mean_ALPS | 31,021 | 39805841 | Figshare (https://figshare.com/articles/dataset/GWAS_summary_statistics_for_ALPS-index/25515331) and GWAS Catalog (GCP001081) |
| Right ALPS-index | Right_ALPS | 31,021 | 39805841 | Figshare (https://figshare.com/articles/dataset/GWAS_summary_statistics_for_ALPS-index/25515331) and GWAS Catalog (GCP001081) |

Inclusion and Exclusion Criteria for the Insomnia GWAS:

Included: Individuals of European ancestry with complete genotype and phenotype data.

Excluded: Individuals of non-European ancestry, those who responded “prefer not to answer,” and those with missing genotype or phenotype data.

Sensitivity Analyses: Secondary analyses were performed on a subset of 377,474 unrelated individuals of white British ancestry, further excluding participants with:

A history of shift work.

Use of hypnotic, antianxiolytic, or psychiatric medications.

A diagnosis of selected chronic diseases or psychiatric illnesses (e.g., major depression, bipolar disorder, schizophrenia, anxiety disorders, substance abuse) as determined by ICD-10 codes, self-report, or nurse-led interviews.

Supplementary Table 2. Genetic architecture parameters for insomnia and ALPS-derived phenotypes estimated by a multi-trait Bayesian model. Parameters include the mean and standard deviation (SD) for the proportion of non-zero effect SNPs (π), the variance of non-zero effect SNPs ($\sigma^2\beta$), the variance of zero-effect SNPs (σ^2_0), SNP-based heritability (h^2), and the number of genome-wide significant SNPs at $p < 10^{-9}$. Model fit was assessed using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). The high similarity in π and $\sigma^2\beta$ between insomnia and ALPS subtypes, despite differing h^2 , supports the presence of shared genetic risk loci.

| Phenotype | π (mean) | π (SD) | $\sigma^2\beta$ | $\sigma^2\beta$ (SD) | σ^2_0 | σ^2_0 (SD) | h^2 | h^2 (SD) | N_GWAS | N_GWAS | AIC | BIC |
|---------------------|--------------|------------|-----------------|----------------------|--------------|-------------------|--------|------------|--------|----------|-------|--------|
| Anterior ALPS-index | 6.48E-04 | 4.78E-04 | 1.43E-04 | 6.95E-05 | 1.054 | 0.0114 | 0.135 | 0.039 | 2068 | 1523 | 8.78 | -0.719 |
| Mean ALPS-index | 1.97E-03 | 1.48E-03 | 9.09E-05 | 8.43E-05 | 1.07 | 0.0137 | 0.154 | 0.0661 | 6297 | 4727 | -12.3 | -21.8 |
| Posterior ALPS- | 1.05E-03 | 9.99E-05 | 8.84E-05 | 7.40E-06 | 1.057 | 0.00215 | 0.189 | 0.00565 | 3348 | 319 | 10.5 | 1.04 |
| Total ALPS-index | 1.11E-03 | 7.27E-05 | 8.15E-05 | 4.64E-06 | 1.059 | 0.00219 | 0.186 | 0.00552 | 3555 | 232 | 9.97 | 0.472 |
| Left ALPS-index | 4.01E-04 | 1.45E-04 | 2.46E-04 | 7.11E-05 | 1.051 | 0.0055 | 0.186 | 0.0245 | 1278 | 463 | 22.2 | 12.8 |
| Mean ALPS-index | 6.90E-04 | 1.08E-19 | 1.26E-04 | 2.71E-20 | 1.058 | 2.22E-16 | 0.18 | 2.78E-17 | 2202 | 9.09E-13 | 37 | 27.5 |
| Right ALPS-index | 4.47E-04 | 1.63E-04 | 2.27E-04 | 8.01E-05 | 1.053 | 0.00667 | 0.185 | 0.0213 | 1426 | 519 | 26.9 | 17.4 |
| Insomnia (GWAS) | 4.00E-03 | 9.04E-04 | 1.05E-05 | 3.17E-06 | 1.0997 | 0.0178 | 0.0802 | 0.00481 | 12745 | 2883 | 84.4 | 74.8 |

Supplementary Table 3. Bivariate genetic architecture decomposition of insomnia and ALPS-derived phenotypes estimated by the MiXeR model. The table presents key parameters including the Dice coefficient (a measure of shared SNP proportion), the proportion of SNPs with effects in both traits (π_{12}), the correlation of effect sizes for shared SNPs (ρ_{beta}), the genome-wide genetic correlation (r_g), and the fraction of shared SNPs with concordant effect directions. Values are reported as mean \pm standard deviation. The high Dice coefficients and π_{12} values indicate significant local genetic overlap. Notably, the low fraction of concordant effects (around 0.48) suggests that approximately half of the shared SNPs exhibit antagonistic pleiotropy, which may explain the overall weak net genetic correlation (r_g).

| Phenotype Pair | Dice Coefficient (mean \pm std) | Proportion of Shared SNPs (π_{12} , mean \pm std) | Effect Size Correlation (ρ_{beta} , mean \pm std) | Genetic Correlation (r_g , mean \pm std) | Fraction of Concordant Effects in Shared SNPs (mean \pm std) |
|-------------------------|-----------------------------------|--|--|---|--|
| Insomnia vs. aALPS | 0.234 \pm 0.149 | 0.00055 \pm 0.00040 | -0.078 \pm 0.085 | -0.024 \pm 0.023 | 0.475 \pm 0.027 |
| Insomnia vs. mALPS | 0.424 \pm 0.340 | 0.00144 \pm 0.00129 | -0.010 \pm 0.129 | 0.003 \pm 0.024 | 0.497 \pm 0.042 |
| Insomnia vs. pALPS | 0.276 \pm 0.092 | 0.00071 \pm 0.00029 | -0.062 \pm 0.114 | -0.011 \pm 0.021 | 0.480 \pm 0.037 |
| Insomnia vs. tALPS | 0.362 \pm 0.116 | 0.00091 \pm 0.00028 | -0.033 \pm 0.066 | -0.010 \pm 0.021 | 0.490 \pm 0.021 |
| Insomnia vs. Left_ALPS | 0.176 \pm 0.070 | 0.00037 \pm 0.00012 | -0.135 \pm 0.052 | -0.038 \pm 0.014 | 0.457 \pm 0.017 |
| Insomnia vs. Mean_ALPS | 0.292 \pm 0.068 | 0.00066 \pm 0.00004 | -0.080 \pm 0.035 | -0.031 \pm 0.015 | 0.475 \pm 0.011 |
| Insomnia vs. Right_ALPS | 0.199 \pm 0.075 | 0.00043 \pm 0.00017 | -0.077 \pm 0.047 | -0.023 \pm 0.016 | 0.476 \pm 0.015 |

Supplementary Table 4. Bivariate genetic architecture decomposition of insomnia and ALPS-derived phenotypes estimated by the MiXeR model. Parameters include the proportion of SNPs with no effect in either trait (π_{00}), effect only in insomnia (π_{10}), effect only in ALPS (π_{01}), and shared effect in both traits (π_{11}). Standard errors (SE) are provided for each proportion. The test statistics represent the χ^2 value from comparing the joint model to independent models, demonstrating a significant improvement in fit (all $p < 10^{-300}$). Despite weak genome-wide genetic correlations ($r_g = -0.038$ to 0.003), the significant π_{11} values indicate detectable local genetic overlap. Notably, approximately half of the shared SNPs exhibit antagonistic pleiotropy (opposite effect directions), which may explain the overall weak net correlation.

| Phenotype | p-value | π_{00} | π_{10} | π_{01} | π_{11} | SE(π_{00}) | SE(π_{10}) | SE(π_{01}) | SE(π_{11}) | Test Statistics |
|----------------------|---------|------------|------------|------------|------------|------------------|------------------|------------------|------------------|-----------------|
| Anterior ALPS-index | 1E-300 | 0.673 | 0.217 | 0.032 | 0.078 | 0.00116 | 0.00122 | 0.00093 | 0.00102 | 3572.48 |
| Mean ALPS-index | 1E-300 | 0.667 | 0.233 | 0.038 | 0.062 | 0.00108 | 0.0011 | 0.00079 | 0.00083 | 2403.78 |
| Posterior ALPS-index | 1E-300 | 0.66 | 0.231 | 0.045 | 0.064 | 0.00112 | 0.00114 | 0.00086 | 0.0009 | 2091.19 |
| Total ALPS-index | 1E-300 | 0.669 | 0.233 | 0.036 | 0.062 | 0.00107 | 0.00109 | 0.00077 | 0.00082 | 2584.66 |
| Left ALPS-index | 1E-300 | 0.668 | 0.202 | 0.039 | 0.091 | 0.0012 | 0.0013 | 0.00102 | 0.00114 | 4176.04 |
| Mean ALPS-index | 1E-300 | 0.68 | 0.206 | 0.027 | 0.087 | 0.00107 | 0.00115 | 0.00085 | 0.00097 | 5960.33 |
| Right ALPS-index | 1E-300 | 0.692 | 0.219 | 0.016 | 0.073 | 0.000998 | 0.00106 | 0.00071 | 0.00082 | 6217.22 |

Supplementary Table 5. Local genetic correlation and Bayesian co-localization analysis between insomnia and ALPS-derived phenotypes at the 17q21.31 locus (chr17: 42,348,004–43,460,500). The table highlights strong local genetic correlations ($\rho > 0.54$) for both Left_ALPS (FDR = 0.008) and Mean_ALPS (FDR = 0.010). The Bayesian co-localization analysis (GWAS-PW) provides overwhelming evidence that this association is driven by a single shared causal variant, with posterior probability $PPA_3 = 0.990$ and 0.993 , respectively. The near-zero probabilities for models 1, 2, and 4 further support the robustness of this finding.

| Phenotype Pair | Chromosome | Start (bp) | End (bp) | Local Genetic Correlation | 95% CI of ρ | p | FDR | PPA_1 | PPA_2 | PPA_3 | PPA_4 |
|------------------------|------------|------------|------------|---------------------------|------------------|----------|----------|----------|----------|----------|----------|
| Insomnia vs. Left_ALPS | 17 | 42,348,004 | 43,460,500 | 0.547 | [0.273, | 2.12E-04 | 8.00E-03 | 8.74E-03 | 9.02E-14 | 9.90E-01 | 9.97E-04 |
| Insomnia vs. Mean_ALPS | 17 | 42,348,004 | 43,460,500 | 0.564 | [0.270, | 3.39E-04 | 1.00E-02 | 5.64E-03 | 1.06E-13 | 9.93E-01 | 1.11E-03 |

Supplementary Table 6. Identification of two independent shared causal variants at the 17q21.31 locus by conjFDR and COLOC analysis. The table highlights two SNPs with significant evidence for sharing causal effects between insomnia and ALPS-derived phenotypes. rs71373536, located downstream of ACBD4, showed strong co-localization with both Left_ALPS and Mean_ALPS (conjFDR = 0.004). rs1044977, a missense variant in the exon of HEXIM1 (CADD score = 18.79), was significantly co-localized with Right_ALPS (conjFDR = 0.020). Both variants were validated by COLOC analysis within a ± 100 kb window, yielding high posterior probabilities for model 4 (PP.H4 > 0.86), indicating that they are likely to be the shared causal variants driving the genetic association at this locus.

| Trait1 | Trait2 | CH R | LEAD_SN P | LEAD_BP | FDR | A1 | A2 | nearestGene | func | CAD D | RD B | Concor dEffect | PP.H0.ab f | PP.H1.ab f | PP.H2.ab f | PP.H3.ab f | PP.H4.ab f |
|-----------------------|-------------------|-----------|-------------------|-----------------|-----------------|----------|----------|---------------|-------------------|--------------|-----------|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Insomnia | aALPS | 5 | rs653444 | 88049341 | 4.11E-02 | T | C | MEF2C | intronic | 1.416 | 7 | Yes | 5.63E-02 | 3.12E-01 | 2.46E-02 | 1.36E-01 | 4.71E-01 |
| Insomnia | mALPS | 1 | rs2644121 | 201881284 | 2.46E-03 | G | A | LMOD1 | intronic | 0.827 | NA | No | 1.62E-07 | 3.65E-02 | 1.35E-06 | 3.05E-01 | 6.59E-01 |
| Insomnia | mALPS | 9 | rs944990 | 96191004 | 1.56E-02 | T | C | RP11-165J3.5 | intergenic | 4.224 | NA | Yes | 1.68E-06 | 2.35E-01 | 1.94E-06 | 2.71E-01 | 4.95E-01 |
| Insomnia | mALPS | 12 | rs4759042 | 57377347 | 4.10E-02 | T | C | GPR182 | intergenic | 2.66 | 6 | No | 7.23E-04 | 9.44E-01 | 3.47E-05 | 4.53E-02 | 1.04E-02 |
| Insomnia | pALPS | 9 | rs9696939 | 103586410 | 1.30E-02 | C | T | RP11-62L10.1 | intergenic | 5.342 | 7 | Yes | 7.41E-02 | 6.35E-02 | 9.94E-02 | 8.46E-02 | 6.78E-01 |
| Insomnia | pALPS | 11 | rs3740689 | 47380593 | 8.02E-03 | A | G | SPI1 | intronic | 6.388 | 5 | Yes | 5.97E-03 | 8.07E-01 | 1.03E-03 | 1.39E-01 | 4.76E-02 |
| Insomnia | tALPS | 1 | rs4494199 | 201884668 | 9.38E-03 | G | A | LMOD1 | intronic | 2.752 | 5 | No | 2.65E-07 | 4.93E-02 | 3.65E-07 | 6.71E-02 | 8.84E-01 |
| Insomnia | Left_ALPS | 5 | rs2067919 | 87783713 | 1.09E-02 | C | T | CTC-498M16.4 | ncRNA_intronic | 4.156 | 5 | No | 1.79E-03 | 1.84E-02 | 8.46E-02 | 8.70E-01 | 2.49E-02 |
| Insomnia | Left_ALPS | 11 | rs61895102 | 47526178 | 4.14E-03 | A | C | CELF1 | intronic | 1.696 | 7 | No | 4.86E-04 | 3.54E-02 | 1.10E-02 | 8.01E-01 | 1.52E-01 |
| Insomnia | Left_ALPS | 16 | rs12445948 | 51463710 | 1.10E-02 | A | G | RP11-437L7.1 | intergenic | 0.446 | 6 | No | 6.18E-03 | 7.54E-02 | 1.55E-03 | 1.81E-02 | 8.99E-01 |
| Insomnia a | Left_ALPS | 17 | rs71373536 | 43221808 | 4.38E-03 | A | G | ACBD4 | downstream | 9.342 | 3a | Yes | 1.39E-11 | 3.80E-02 | 1.24E-11 | 3.30E-02 | 9.29E-01 |
| Insomnia | Mean_ALPS | 5 | rs2067919 | 87783713 | 1.98E-02 | C | T | CTC-498M16.4 | ncRNA_intronic | 4.156 | 5 | No | 1.79E-03 | 1.84E-02 | 8.46E-02 | 8.70E-01 | 2.49E-02 |
| Insomnia | Mean_ALPS | 11 | rs61895104 | 47527795 | 6.28E-03 | A | G | CELF1 | intronic | 1.32 | 7 | No | 8.17E-04 | 5.89E-02 | 1.17E-02 | 8.42E-01 | 8.66E-02 |
| Insomnia | Mean_ALPS | 16 | rs12445948 | 51463710 | 2.19E-02 | A | G | RP11-437L7.1 | intergenic | 0.446 | 6 | No | 9.55E-03 | 1.17E-01 | 1.90E-03 | 2.24E-02 | 8.50E-01 |
| Insomnia a | Mean_ALPS | 17 | rs71373536 | 43221808 | 3.57E-03 | A | G | ACBD4 | downstream | 9.342 | 3a | Yes | 9.37E-12 | 2.56E-02 | 1.43E-11 | 3.81E-02 | 9.36E-01 |
| Insomnia | Right_ALPS | 5 | rs2194028 | 87825490 | 4.65E-02 | T | C | LINC00461 | ncRNA_intronic | 2.038 | 6 | No | 5.58E-02 | 3.96E-01 | 6.42E-02 | 4.55E-01 | 2.96E-02 |
| Insomnia | Right_ALPS | 11 | rs79513206 | 47393494 | 2.59E-02 | T | C | SPI1 | intronic | 2.992 | 7 | No | 7.10E-04 | 9.71E-02 | 6.39E-03 | 8.73E-01 | 2.26E-02 |
| Insomnia | Right_ALPS | 12 | rs12824957 | 123750228 | 4.62E-02 | C | T | CDK2AP1 | intronic | 3.665 | 5 | No | 2.31E-01 | 4.03E-02 | 3.03E-01 | 5.26E-02 | 3.73E-01 |
| Insomnia a | Right_ALPS | 17 | rs1044977 | 43227214 | 2.04E-02 | C | T | HEXIM1 | exonic | 18.79 | 4 | Yes | 3.46E-11 | 9.47E-02 | 1.64E-11 | 4.40E-02 | 8.61E-01 |

Supplementary Table 7. Fine-mapping results at the 17q21.31 locus using both SuSiE and FINEMAP algorithms within a ± 100 kb window around the lead SNPs rs1044977 and rs71373536. Posterior probabilities (PP) from both methods are reported for all candidate causal SNPs with a CADD score > 10 or strong linkage disequilibrium (LD, $r^2 > 0.8$) with the conjFDR lead SNP.

For the rs1044977 locus, FINEMAP identified a single, optimal configuration with a posterior probability of 1.0, which includes rs9894577 as one of the five causal variants. Although rs9894577 has a very low SuSiE PP, its perfect FINEMAP PP (1.0) in the top-ranked configuration makes it the primary candidate. The initially significant lead SNP, rs1044977, while not included in the highest-confidence credible set, exhibits extremely strong LD ($r^2 > 0.95$) with rs9894577 and possesses a high CADD score (18.79), suggesting it is a highly plausible proxy or potentially functional variant itself.

For the rs71373536 locus, rs6503419 was consistently prioritized by both SuSiE (PP = 1.0) and FINEMAP (PP = 1.0), making it the unequivocal primary causal candidate. The lead SNP rs71373536 shows strong LD ($r^2 > 0.8$) with rs6503419, indicating they likely tag the same underlying causal signal.

Other SNPs, such as rs558237097, were also strongly implicated by fine-mapping but were not selected as the "primary" candidates because their posterior probabilities, while high, did not achieve the maximum confidence level (PP = 1.0) in the dominant model configuration identified by the algorithms.

| Region | Lead SNP (conjFDR) | Candidate Causal SNP | P | SuSiE PP | FINEMAP PP | Consensus | Location (Gene Cluster) | CADD Score | LD with Lead SNP (r^2) |
|----------|--------------------|----------------------|----------|----------|------------|-----------|-------------------------|------------|----------------------------|
| 17q21.31 | rs1044977 | rs139903667 | 1.70E-01 | 1.00E+00 | 1.00E+00 | Yes | ACBD4-HEXI M1-PLCD3 | 18.79 | $r^2 > 0.95$ |
| 17q21.31 | rs1044977 | rs558237097 | 1.40E-12 | 9.99E-01 | 1.00E+00 | Yes | ACBD4-HEXI M1-PLCD3 | 18.79 | $r^2 > 0.95$ |
| 17q21.31 | rs1044977 | rs9894577 | 1.50E-16 | 3.34E-13 | 1.00E+00 | No | ACBD4-HEXI M1-PLCD3 | 18.79 | $r^2 > 0.95$ |
| 17q21.31 | rs71373536 | rs6503419 | 2.30E-09 | 1.00E+00 | 1.00E+00 | Yes | DCAKD-NMT 1-PLCD3 | 9.34 | $r^2 > 0.80$ |

Supplementary Table 8. Gene-level fine-mapping results at the 17q21.31 locus using the FOCUS algorithm. The table summarizes the top candidate causal genes identified based on their posterior probability (pips) and TWAS Z-scores across multiple brain tissues and whole blood. HEXIM1 was consistently prioritized with very high pips (>0.94) in cerebellar hemisphere, anterior cingulate cortex, and whole blood, and its expression level showed a significant negative association with insomnia risk (TWAS $Z = -7.43$). This is further supported by the presence of a missense variant (rs1044977) within HEXIM1 with a high CADD score (18.79), suggesting potential functional impairment. EFTUD2 emerged as another strong candidate, showing extremely high pips (>0.95) and a significant positive association with insomnia risk (TWAS $Z = 7.92$) in multiple brain regions, including frontal cortex, hippocampus, and spinal cord. These findings pinpoint HEXIM1 and EFTUD2 as key molecular players linking genetic variation at 17q21.31 to insomnia susceptibility.

| Gene | Tissue/Cell Type | Posterior Probability (pips) | TWAS Z-score | Functional Annotation |
|--------|---------------------------------------|------------------------------|--------------|---|
| HEXIM1 | brain_cerebellar_hemisphere | 0.971 | -7.43 | Protein-coding, intronic, high CADD score (18.79) for rs1044977 |
| HEXIM1 | brain_anterior_cingulate_cortex_ba24 | 0.964 | -7.43 | Protein-coding, intronic, high CADD score (18.79) for rs1044977 |
| HEXIM1 | whole_blood | 0.94 | -7.43 | Protein-coding, intronic, high CADD score (18.79) for rs1044977 |
| EFTUD2 | brain_frontal_cortex_ba9 | 0.991 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_spinal_cord_cervical_c-1 | 0.975 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_hippocampus | 0.957 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_dorsolateral_prefrontal_cortex | 0.955 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_caudate_basal_ganglia | 0.948 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_cerebellum | 0.946 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_cortex | 0.887 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_hypothalamus | 0.885 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_amygdala | 0.883 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_substantia_nigra | 0.883 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_putamen_basal_ganglia | 0.878 | 7.92 | Protein-coding, intronic |
| EFTUD2 | brain_nucleus_accumbens_basal_ganglia | 0.84 | 7.92 | Protein-coding, intronic |

Supplementary Table 9. List of candidate genes within the 17q21.31 locus that were annotated to the lead SNPs (rs71373536 and rs1044977) from prior conjFDR and fine-mapping analyses, and subsequently used as input for the S-PrediXcan-based transcriptome-wide association study (TWAS).

| Trait | IndSigSNPs | symbol | pLI | ncRVIS | posMapSNPs | eqtlMapSNPs | eqtlMapts | ciMapts |
|-----------|------------|---------|------------|--------------|------------|-------------|---|---------------------------|
| Left_ALPS | rs71373536 | TMUB2 | 0.00130114 | -0.162668534 | 0 | 8 | GTEEx/v8/Cells_EBV-transformed_lymphocytes | Promoter_anchored_loops |
| Left_ALPS | rs71373536 | RUNDC3A | 0.96033402 | NA | 0 | 0 | NA | Adult_Cortex |
| Left_ALPS | rs71373536 | GPATCH8 | 0.99949549 | -0.594351478 | 0 | 0 | NA | Promoter_anchored_loops |
| Left_ALPS | rs71373536 | CCDC43 | 0.00025718 | -0.924707928 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Left_ALPS | rs71373536 | ADAM11 | 0.02473638 | 0.499905297 | 0 | 0 | NA | Adult_Cortex |
| Left_ALPS | rs71373536 | GJC1 | 0.94410528 | -2.782988352 | 0 | 0 | NA | Fetal_Cortex |
| Left_ALPS | rs71373536 | HIGD1B | 0.00234558 | -0.344882798 | 0 | 0 | NA | Fetal_Cortex |
| Left_ALPS | rs71373536 | EFTUD2 | 0.99999144 | 0.211209263 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Left_ALPS | rs71373536 | CCDC103 | 0.00218552 | 3.73457e-05 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Left_ALPS | rs71373536 | FAM187A | NA | NA | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Left_ALPS | rs71373536 | GFAP | 2.23E-05 | -0.265503436 | 0 | 0 | NA | Adult_Cortex |
| Left_ALPS | rs71373536 | DCAKD | 0.02938609 | 0.848595011 | 0 | 22 | GTEEx/v8/Whole_Blood:GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9 | NA |

| | | | | | | | | |
|-----------|------------|---------|------------|--------------|----|----|--|---------------------------|
| Left_ALPS | rs71373536 | NMT1 | 0.99850052 | 0.032447683 | 0 | 22 | GTEEx/v8/Brain_Anterior_cingulate_cortex_BA24:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hippocampus:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_g | NA |
| Left_ALPS | rs71373536 | PLCD3 | 0.0001433 | NA | 4 | 0 | NA | NA |
| Left_ALPS | rs71373536 | ACBD4 | 1.83E-05 | -0.326407022 | 13 | 12 | GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Hippocampus | Promoter_anchored_loops |
| Left_ALPS | rs71373536 | HEXIM1 | 0.94440023 | -1.495314951 | 17 | 22 | GTEEx/v8/Cells_EBV-transformed_lymphocytes:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_ganglia:GTEEx/v8/Brain_Substantia_nigra | Promoter_anchored_loops |
| Left_ALPS | rs71373536 | HEXIM2 | 0.36823651 | -0.798107113 | 14 | 0 | NA | Promoter_anchored_loops |
| Left_ALPS | rs71373536 | SPATA32 | 2.95E-05 | -0.414755704 | 0 | 5 | GTEEx/v8/Brain_Cerebellum | NA |
| Left_ALPS | rs71373536 | MAPT | 4.68E-05 | 2.01024275 | 0 | 5 | GTEEx/v8/Brain_Substantia_nigra | Adult_Cortex |
| Mean_ALPS | rs71373536 | TMUB2 | 0.00130114 | -0.162668534 | 0 | 8 | GTEEx/v8/Cells_EBV-transformed_lymphocytes | Promoter_anchored_loops |
| Mean_ALPS | rs71373536 | RUNDC3A | 0.96033402 | NA | 0 | 0 | NA | Adult_Cortex |
| Mean_ALPS | rs71373536 | GPATCH8 | 0.99949549 | -0.594351478 | 0 | 0 | NA | Promoter_anchored_loops |
| Mean_ALPS | rs71373536 | CCDC43 | 0.00025718 | -0.924707928 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Mean_ALPS | rs71373536 | ADAM11 | 0.02473638 | 0.499905297 | 0 | 0 | NA | Adult_Cortex |
| Mean_ALPS | rs71373536 | GJC1 | 0.94410528 | -2.782988352 | 0 | 0 | NA | Fetal_Cortex |
| Mean_ALPS | rs71373536 | HIGD1B | 0.00234558 | -0.344882798 | 0 | 0 | NA | Fetal_Cortex |
| Mean_ALPS | rs71373536 | EFTUD2 | 0.99999144 | 0.211209263 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |

| | | | | | | | | |
|------------|------------|---------|------------|--------------|----|----|--|---------------------------|
| Mean_ALPS | rs71373536 | CCDC103 | 0.00218552 | 3.73457e-05 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Mean_ALPS | rs71373536 | FAM187A | NA | NA | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Mean_ALPS | rs71373536 | GFAP | 2.23E-05 | -0.265503436 | 0 | 0 | NA | Adult_Cortex |
| Mean_ALPS | rs71373536 | DCAKD | 0.02938609 | 0.848595011 | 0 | 22 | GTEEx/v8/Whole_Blood:GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9 | NA |
| Mean_ALPS | rs71373536 | NMT1 | 0.99850052 | 0.032447683 | 0 | 22 | GTEEx/v8/Brain_Anterior_cingulate_cortex_BA24:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hippocampus:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_g | NA |
| Mean_ALPS | rs71373536 | PLCD3 | 0.0001433 | NA | 4 | 0 | NA | NA |
| Mean_ALPS | rs71373536 | ACBD4 | 1.83E-05 | -0.326407022 | 13 | 12 | GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Hippocampus | Promoter_anchored_loops |
| Mean_ALPS | rs71373536 | HEXIM1 | 0.94440023 | -1.495314951 | 17 | 22 | GTEEx/v8/Cells_EBV-transformed_lymphocytes:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_ganglia:GTEEx/v8/Brain_Substantia_nigra | Promoter_anchored_loops |
| Mean_ALPS | rs71373536 | HEXIM2 | 0.36823651 | -0.798107113 | 14 | 0 | NA | Promoter_anchored_loops |
| Mean_ALPS | rs71373536 | SPATA32 | 2.95E-05 | -0.414755704 | 0 | 5 | GTEEx/v8/Brain_Cerebellum | NA |
| Mean_ALPS | rs71373536 | MAPT | 4.68E-05 | 2.01024275 | 0 | 5 | GTEEx/v8/Brain_Substantia_nigra | Adult_Cortex |
| Right_ALPS | rs1044977 | TMUB2 | 0.00130114 | -0.162668534 | 0 | 8 | GTEEx/v8/Cells_EBV-transformed_lymphocytes | Promoter_anchored_loops |
| Right_ALPS | rs1044977 | RUNDC3A | 0.96033402 | NA | 0 | 0 | NA | Adult_Cortex |

| | | | | | | | | |
|------------|-----------|---------|------------|--------------|----|----|--|---------------------------|
| Right_ALPS | rs1044977 | GPATCH8 | 0.99949549 | -0.594351478 | 0 | 0 | NA | Promoter_anchored_loops |
| Right_ALPS | rs1044977 | CCDC43 | 0.00025718 | -0.924707928 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Right_ALPS | rs1044977 | ADAM11 | 0.02473638 | 0.499905297 | 0 | 0 | NA | Adult_Cortex |
| Right_ALPS | rs1044977 | GJC1 | 0.94410528 | -2.782988352 | 0 | 0 | NA | Fetal_Cortex |
| Right_ALPS | rs1044977 | HIGD1B | 0.00234558 | -0.344882798 | 0 | 0 | NA | Fetal_Cortex |
| Right_ALPS | rs1044977 | EFTUD2 | 0.99999144 | 0.211209263 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Right_ALPS | rs1044977 | CCDC103 | 0.00218552 | 3.73457e-05 | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Right_ALPS | rs1044977 | FAM187A | NA | NA | 0 | 0 | NA | Adult_Cortex:Fetal_Cortex |
| Right_ALPS | rs1044977 | GFAP | 2.23E-05 | -0.265503436 | 0 | 0 | NA | Adult_Cortex |
| Right_ALPS | rs1044977 | DCAKD | 0.02938609 | 0.848595011 | 0 | 22 | GTEEx/v8/Whole_Blood:GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9 | NA |
| Right_ALPS | rs1044977 | NMT1 | 0.99850052 | 0.032447683 | 0 | 22 | GTEEx/v8/Brain_Anterior_cingulate_cortex_BA24:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hippocampus:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_ganglia | NA |
| Right_ALPS | rs1044977 | PLCD3 | 0.0001433 | NA | 4 | 0 | NA | NA |
| Right_ALPS | rs1044977 | ACBD4 | 1.83E-05 | -0.326407022 | 13 | 12 | GTEEx/v8/Brain_Cerebellar_Hemisphere:GTEEx/v8/Brain_Cerebellum:GTEEx/v8/Brain_Hippocampus | Promoter_anchored_loops |

| | | | | | | | | |
|------------|-----------|---------|------------|--------------|----|----|--|-------------------------|
| Right_ALPS | rs1044977 | HEXIM1 | 0.94440023 | -1.495314951 | 17 | 22 | GTEEx/v8/Cells_EBV-transformed_lymphocytes:GTEEx/v8/Brain_Cortex:GTEEx/v8/Brain_Frontal_Cortex_BA9:GTEEx/v8/Brain_Hypothalamus:GTEEx/v8/Brain_Nucleus_accumbens_basal_ganglia:GTEEx/v8/Brain_Putamen_basal_ganglia:GTEEx/v8/Brain_Substantia_nigra | Promoter_anchored_loops |
| Right_ALPS | rs1044977 | HEXIM2 | 0.36823651 | -0.798107113 | 14 | 0 | NA | Promoter_anchored_loops |
| Right_ALPS | rs1044977 | SPATA32 | 2.95E-05 | -0.414755704 | 0 | 5 | GTEEx/v8/Brain_Cerebellum | NA |
| Right_ALPS | rs1044977 | MAPT | 4.68E-05 | 2.01024275 | 0 | 5 | GTEEx/v8/Brain_Substantia_nigra | Adult_Cortex |

Supplementary Table 10. Transcriptome-wide association study (TWAS) results for candidate genes within the 17q21.31 locus, performed in whole blood tissue using the S-PrediXcan method.

| Trait | Gene Symbol | Z-score | P-value | FDR |
|------------|-------------|---------|----------|----------|
| Insomnia | GPATCH8 | -2.81 | 5.00E-03 | 1.25E-02 |
| Insomnia | DCAKD | -5.97 | 2.42E-09 | 2.42E-08 |
| Insomnia | ACBD4 | 4.02 | 5.80E-05 | 2.90E-04 |
| Insomnia | HEXIM1 | 3.29 | 1.00E-03 | 3.33E-03 |
| aALPS | RUNDC3A | 3.11 | 1.88E-03 | 1.88E-02 |
| Left_ALPS | RUNDC3A | 3.14 | 1.72E-03 | 1.72E-02 |
| Mean_ALPS | RUNDC3A | 3.37 | 7.57E-04 | 7.57E-03 |
| Mean_ALPS | ACBD4 | 2.97 | 2.98E-03 | 1.49E-02 |
| Right_ALPS | RUNDC3A | 3.25 | 1.17E-03 | 7.08E-03 |
| Right_ALPS | PLCD3 | 2.44 | 1.48E-02 | 4.95E-02 |
| Right_ALPS | ACBD4 | 3.19 | 1.42E-03 | 7.08E-03 |

Supplementary Table 11. Summary-data-based Mendelian randomization (SMR) results for the ACBD4 gene, which was annotated to the lead SNP rs2291447 at the 17q21.31 locus, performed in whole blood tissue. The table highlights a significant positive causal relationship between ACBD4 expression and both insomnia and multiple ALPS subtypes (Mean_ALPS, Right_ALPS), with $p_{SMR} < 0.05$. A value of 'NA' for p_{HEIDI} indicates that the HEIDI test could not be performed, typically due to insufficient number of independent cis-eQTLs (less than two) being available as instrumental variables for that specific gene-trait pair.

| Trait | Gene Symbol | ProbeChr r | Probe_bp | topSNP | topSNP_bp | b_GWAS | se_GWAS | p_GWAS | b_eQTL L | se_eQTL | p_eQTL | b_SMR | se_SMR | p_SMR | FDR |
|------------|-------------|---------------|----------|----------|-----------|----------|---------|----------|-------------|---------|----------|---------|--------|---------|---------|
| Insomnia | ACBD | 17 | 43209967 | rs229144 | 43212963 | 0.0056 | 0.0014 | 5.10E-05 | 0.1173 | 0.0204 | 9.50E-09 | 0.0482 | 0.0145 | 0.00088 | 0.00705 |
| Right_ALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | 0.0247 | 0.0077 | 1.40E-03 | 0.1173 | 0.0204 | 9.50E-09 | 0.2107 | 0.0755 | 0.00525 | 0.02898 |
| Mean_ALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | 0.0229 | 0.0077 | 2.94E-03 | 0.1173 | 0.0204 | 9.50E-09 | 0.195 | 0.0738 | 0.00828 | 0.02898 |
| Left_ALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | 0.0187 | 0.0077 | 1.52E-02 | 0.1173 | 0.0204 | 9.50E-09 | 0.1595 | 0.0714 | 0.02538 | 0.05922 |
| pALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | -0.00255 | 0.00148 | 8.48E-02 | 0.1173 | 0.0204 | 9.50E-09 | -0.0218 | 0.0132 | 0.09884 | 0.17296 |
| tALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | -0.00217 | 0.00139 | 1.19E-01 | 0.1173 | 0.0204 | 9.50E-09 | -0.0185 | 0.0123 | 0.132 | 0.18478 |
| mALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | -0.00235 | 0.00173 | 1.75E-01 | 0.1173 | 0.0204 | 9.50E-09 | -0.0201 | 0.0152 | 0.1867 | 0.21782 |
| aALPS | ACBD | 17 | 43209967 | rs229144 | 43212963 | -0.00162 | 0.00148 | 2.73E-01 | 0.1173 | 0.0204 | 9.50E-09 | -0.0138 | 0.0128 | 0.2815 | 0.28152 |

Supplementary Table 12. Transcriptome-wide association study (TWAS) results for candidate genes within the 17q21.31 locus, performed in various brain tissues using the S-MultiXcan method. The table highlights three key genes — HEXIM1, ACBD4, and MAPT — that show significant associations with both insomnia and multiple ALPS subtypes across different brain regions.

| Trait | Gene Symbol | pvalue | p_i_best | Best Tissue | Z_mean | z_sd | FDR |
|------------|-------------|----------|----------|---------------------------------------|--------|-------|----------|
| Mean_ALPS | HEXIM1 | 7.79E-04 | 1.52E-05 | Brain_Caudate_basal_ganglia | -2.814 | 1.317 | 1.00E-02 |
| Right_ALPS | HEXIM1 | 8.00E-04 | 4.15E-05 | Brain_Caudate_basal_ganglia | -2.632 | 1.148 | 1.00E-02 |
| Left_ALPS | HEXIM1 | 2.07E-03 | 3.67E-05 | Brain_Caudate_basal_ganglia | -2.723 | 1.411 | 1.60E-02 |
| Left_ALPS | MAPT | 2.46E-03 | 2.60E-03 | Brain_Caudate_basal_ganglia | -1.043 | 2.785 | 1.60E-02 |
| aALPS | DCAKD | 8.23E-03 | 7.10E-02 | Brain_Hypothalamus | -0.332 | 0.870 | 4.33E-02 |
| Right_ALPS | ACBD4 | 8.45E-03 | 8.66E-04 | Brain_Hypothalamus | 2.600 | 0.604 | 4.50E-02 |
| Mean_ALPS | ACBD4 | 8.92E-03 | 8.42E-04 | Brain_Hypothalamus | 2.489 | 0.641 | 4.80E-02 |
| Insomnia | HEXIM1 | 1.20E-16 | 5.24E-20 | Brain_Putamen_basal_ganglia | -6.774 | 2.198 | 1.56E-15 |
| Insomnia | ACBD4 | 9.89E-12 | 6.05E-06 | Brain_Nucleus_accumbens_basal_ganglia | 3.061 | 1.507 | 6.43E-11 |
| Insomnia | NMT1 | 1.09E-09 | 6.31E-12 | Brain_Nucleus_accumbens_basal_ganglia | 5.537 | 1.881 | 4.72E-09 |
| Insomnia | DCAKD | 7.85E-09 | 3.10E-09 | Brain_Substantia_nigra | -4.741 | 1.322 | 2.55E-08 |
| Insomnia | MAPT | 2.75E-03 | 9.20E-04 | Brain_Spinal_cord_cervical_c- | 1.626 | 2.388 | 7.15E-03 |
| Insomnia | ADAM11 | 1.04E-02 | 1.10E-03 | Brain_Anterior_cingulate_cortex_BA24 | -0.462 | 2.202 | 2.25E-02 |
| Insomnia | GPATCH8 | 2.48E-02 | 6.60E-03 | Brain_Frontal_Cortex_BA9 | -1.564 | 1.629 | 4.61E-02 |

Supplementary Table 13. Summary-data-based Mendelian randomization (SMR) results for the ACBD4 gene, which was annotated to the lead SNP rs2291447 at the 17q21.31 locus, performed in various brain tissues. The table highlights a significant positive causal relationship between ACBD4 expression and both insomnia and multiple ALPS subtypes (Mean_ALPS, Right_ALPS), with $p_{SMR} < 0.05$. A value of 'NA' for p_{HEIDI} indicates that the HEIDI test could not be performed, typically due to insufficient number of independent cis-eQTLs (less than two) being available as instrumental variables for that specific gene-trait pair.

| Trait | Gene Symbol | Probe Chr | Probe_bp | topSNP | topSNP_bp | Tissue/Cell Type | b_GW_AS | se_G_WAS | p_GWA_S | b_eQ_TL | se_eQTL | p_eQTL | b_SM_R | se_S_MR | p_SMR | p_HEIDI | nsnp_HEIDI | FDR |
|------------|-------------|-----------|----------|-----------|-----------|--------------------------|---------|----------|----------|---------|---------|----------|--------|---------|----------|----------|------------|----------|
| Insomnia | ACBD | 17 | 43209967 | rs2291447 | 4.3E+07 | Cerebellum | 0.006 | 0.001 | 5.10E-05 | 0.400 | 0.045 | 9.00E-19 | 0.014 | 0.004 | 2.11E-04 | 3.35E-02 | 16 | 1.51E-03 |
| Insomnia | ACBD_4 | 17 | 43209967 | rs8069937 | 4.3E+07 | Cerebellar_Hemisph | 0.006 | 0.001 | 5.80E-05 | 0.331 | 0.044 | 3.40E-14 | 0.017 | 0.005 | 3.58E-04 | 3.28E-01 | 12 | 2.18E-03 |
| Insomnia | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Spinal_cord_cervical_c-1 | 0.006 | 0.001 | 5.10E-05 | 0.393 | 0.066 | 2.14E-09 | 0.014 | 0.004 | 7.46E-04 | 1.81E-01 | 3 | 4.36E-03 |
| Right_ALPS | ACBD_4 | 17 | 43209967 | rs8069937 | 4.3E+07 | Cerebellar_Hemisph | 0.025 | 0.008 | 1.46E-03 | 0.331 | 0.044 | 3.40E-14 | 0.074 | 0.025 | 3.33E-03 | 4.48E-01 | 13 | 2.71E-02 |
| Mean_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cerebellum | 0.023 | 0.008 | 2.94E-03 | 0.400 | 0.045 | 9.00E-19 | 0.057 | 0.020 | 4.82E-03 | 4.70E-02 | 17 | 2.71E-02 |
| Right_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cerebellum | 0.025 | 0.008 | 1.40E-03 | 0.400 | 0.045 | 9.00E-19 | 0.062 | 0.021 | 2.66E-03 | 8.02E-02 | 17 | 2.71E-02 |
| Right_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cortex | 0.025 | 0.008 | 1.40E-03 | 0.344 | 0.055 | 3.65E-10 | 0.072 | 0.025 | 4.43E-03 | NA | NA | 2.71E-02 |
| Right_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Spinal_cord_cervical_c-1 | 0.025 | 0.008 | 1.40E-03 | 0.393 | 0.066 | 2.14E-09 | 0.063 | 0.022 | 4.83E-03 | 9.92E-01 | 3 | 2.71E-02 |
| Mean_ALPS | ACBD_4 | 17 | 43209967 | rs8069937 | 4.3E+07 | Cerebellar_Hemisph | 0.023 | 0.008 | 3.06E-03 | 0.331 | 0.044 | 3.40E-14 | 0.069 | 0.025 | 5.80E-03 | 3.30E-01 | 13 | 2.71E-02 |
| Mean_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cortex | 0.023 | 0.008 | 2.94E-03 | 0.344 | 0.055 | 3.65E-10 | 0.067 | 0.025 | 7.21E-03 | NA | NA | 2.71E-02 |
| Mean_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Spinal_cord_cervical_c-1 | 0.023 | 0.008 | 2.94E-03 | 0.393 | 0.066 | 2.14E-09 | 0.058 | 0.022 | 7.74E-03 | 7.71E-01 | 3 | 2.71E-02 |
| Left_ALPS | ACBD_4 | 17 | 43209967 | rs8069937 | 4.3E+07 | Cerebellar_Hemisph | 0.019 | 0.008 | 1.57E-02 | 0.331 | 0.044 | 3.40E-14 | 0.056 | 0.024 | 2.13E-02 | 2.54E-01 | 13 | 5.71E-02 |
| Left_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cerebellum | 0.019 | 0.008 | 1.52E-02 | 0.400 | 0.045 | 9.00E-19 | 0.047 | 0.020 | 1.92E-02 | 4.07E-02 | 17 | 5.71E-02 |
| Left_ALPS | ACBD_4 | 17 | 43209967 | rs2291447 | 4.3E+07 | Cortex | 0.019 | 0.008 | 1.52E-02 | 0.344 | 0.055 | 3.65E-10 | 0.054 | 0.024 | 2.36E-02 | NA | NA | 5.71E-02 |

| | | | | | | | | | | | | | | | | | | |
|-----------|--------|----|----------|------------|---------|------------------------|--------|-------|----------|-------|-------|----------|--------|-------|----------|----------|----|----------|
| Left_ALPS | ACBD_4 | 17 | 43209967 | rs229144_7 | 4.3E+07 | Spinal_cervical_c-1 | 0.019 | 0.008 | 1.52E-02 | 0.393 | 0.066 | 2.14E-09 | 0.048 | 0.021 | 2.45E-02 | 4.26E-01 | 3 | 5.71E-02 |
| pALPS | ACBD_4 | 17 | 43209967 | rs806993_7 | 4.3E+07 | Cerebellar_Hemispheres | -0.003 | 0.001 | 7.44E-02 | 0.331 | 0.044 | 3.40E-14 | -0.008 | 0.005 | 8.24E-02 | 8.83E-02 | 13 | 1.71E-01 |
| pALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cerebellum | -0.003 | 0.001 | 8.48E-02 | 0.400 | 0.045 | 9.00E-19 | -0.006 | 0.004 | 9.07E-02 | 1.01E-01 | 17 | 1.71E-01 |
| pALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cortex | -0.003 | 0.001 | 8.48E-02 | 0.344 | 0.055 | 3.65E-10 | -0.007 | 0.004 | 9.66E-02 | NA | NA | 1.71E-01 |
| pALPS | ACBD_4 | 17 | 43209967 | rs229144_7 | 4.3E+07 | Spinal_cervical_c-1 | -0.003 | 0.001 | 8.48E-02 | 0.393 | 0.066 | 2.14E-09 | -0.006 | 0.004 | 9.77E-02 | 1.31E-02 | 3 | 1.71E-01 |
| tALPS | ACBD_4 | 17 | 43209967 | rs806993_7 | 4.3E+07 | Cerebellar_Hemispheres | -0.002 | 0.001 | 1.14E-01 | 0.331 | 0.044 | 3.40E-14 | -0.007 | 0.004 | 1.21E-01 | 9.71E-02 | 13 | 1.83E-01 |
| tALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cerebellum | -0.002 | 0.001 | 1.19E-01 | 0.400 | 0.045 | 9.00E-19 | -0.005 | 0.004 | 1.24E-01 | 1.25E-01 | 17 | 1.83E-01 |
| tALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cortex | -0.002 | 0.001 | 1.19E-01 | 0.344 | 0.055 | 3.65E-10 | -0.006 | 0.004 | 1.30E-01 | NA | NA | 1.83E-01 |
| tALPS | ACBD_4 | 17 | 43209967 | rs229144_7 | 4.3E+07 | Spinal_cervical_c-1 | -0.002 | 0.001 | 1.19E-01 | 0.393 | 0.066 | 2.14E-09 | -0.006 | 0.004 | 1.31E-01 | 2.75E-02 | 3 | 1.83E-01 |
| mALPS | ACBD_4 | 17 | 43209967 | rs806993_7 | 4.3E+07 | Cerebellar_Hemispheres | -0.002 | 0.002 | 1.58E-01 | 0.331 | 0.044 | 3.40E-14 | -0.007 | 0.005 | 1.65E-01 | 1.39E-01 | 13 | 2.17E-01 |
| mALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cerebellum | -0.002 | 0.002 | 1.75E-01 | 0.400 | 0.045 | 9.00E-19 | -0.006 | 0.004 | 1.80E-01 | 1.87E-01 | 17 | 2.17E-01 |
| mALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cortex | -0.002 | 0.002 | 1.75E-01 | 0.344 | 0.055 | 3.65E-10 | -0.007 | 0.005 | 1.85E-01 | NA | NA | 2.17E-01 |
| mALPS | ACBD_4 | 17 | 43209967 | rs229144_7 | 4.3E+07 | Spinal_cervical_c-1 | -0.002 | 0.002 | 1.75E-01 | 0.393 | 0.066 | 2.14E-09 | -0.006 | 0.005 | 1.86E-01 | 3.83E-02 | 3 | 2.17E-01 |
| aALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cerebellum | -0.002 | 0.001 | 2.73E-01 | 0.400 | 0.045 | 9.00E-19 | -0.004 | 0.004 | 2.77E-01 | 2.61E-01 | 17 | 2.91E-01 |
| aALPS | ACBD | 17 | 43209967 | rs229144 | 4.3E+07 | Cortex | -0.002 | 0.001 | 2.73E-01 | 0.344 | 0.055 | 3.65E-10 | -0.005 | 0.004 | 2.80E-01 | NA | NA | 2.91E-01 |
| aALPS | ACBD_4 | 17 | 43209967 | rs229144_7 | 4.3E+07 | Spinal_cervical_c-1 | -0.002 | 0.001 | 2.73E-01 | 0.393 | 0.066 | 2.14E-09 | -0.004 | 0.004 | 2.81E-01 | 1.01E-01 | 3 | 2.91E-01 |
| aALPS | ACBD_4 | 17 | 43209967 | rs806993_7 | 4.3E+07 | Cerebellar_Hemispheres | -0.002 | 0.001 | 3.04E-01 | 0.331 | 0.044 | 3.40E-14 | -0.005 | 0.004 | 3.08E-01 | 2.05E-01 | 13 | 3.08E-01 |

Supplementary Table 14. Results of Mendelian randomization (SMR) analysis based on summary data, analyzing the MAPT gene at 17q21.31, associated with leader SNP 43964539, across different brain cell types. This table highlights a significant causal relationship between MAPT expression and insomnia and multiple ALPS subtypes. A p_HEIDI value of "NA" indicates that a HEIDI test could not be performed, typically due to an insufficient number (less than two) of independent cis-eQTLs available as instrumental variables for that specific gene-trait pair.

| Trait | Gene Symbol | Probe_eChr | Probe_bp | topSNP | topSNP_bp | Tissue/Cell Type | b_GW AS | se_GW AS | p_GWA S | b_eQ TL | se_eQ TL | p_eQTL | b_SMR | se_SM R | p_SMR | p_HEIDI | n SNP HEIDI | FDR |
|------------|-------------|------------|----------|----------------|-----------|------------------|---------|----------|----------|---------|----------|----------|--------|---------|----------|----------|-------------|----------|
| Insomnia | MAPT | 17 | 44064461 | rs2696541 | 44351743 | Astrocytes | -0.003 | 0.002 | 1.70E-01 | 0.596 | 0.084 | 1.32E-12 | -0.004 | 0.003 | 1.74E-01 | 9.07E-01 | 8 | 2.14E-01 |
| aALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.007 | 0.002 | 2.99E-05 | 0.502 | 0.071 | 1.98E-12 | -0.015 | 0.004 | 3.30E-04 | 7.36E-01 | 3 | 7.85E-03 |
| Left_ALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.023 | 0.009 | 1.45E-02 | 0.502 | 0.071 | 1.98E-12 | -0.045 | 0.020 | 2.09E-02 | 6.54E-01 | 3 | 1.27E-01 |
| mALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.013 | 0.002 | 5.68E-10 | 0.502 | 0.071 | 1.98E-12 | -0.026 | 0.006 | 3.29E-06 | 7.71E-01 | 3 | 2.47E-04 |
| Mean_ALPS | MAPT | 17 | 44064461 | rs6205554 4 | 43964539 | Astrocytes | -0.037 | 0.009 | 7.75E-05 | 0.502 | 0.071 | 1.98E-12 | -0.073 | 0.021 | 5.69E-04 | 2.62E-01 | 3 | 9.67E-03 |
| pALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.010 | 0.002 | 8.87E-09 | 0.502 | 0.071 | 1.98E-12 | -0.020 | 0.005 | 8.45E-06 | 1.93E-01 | 3 | 3.35E-04 |
| Right_ALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.046 | 0.009 | 6.81E-07 | 0.502 | 0.071 | 1.98E-12 | -0.092 | 0.023 | 4.95E-05 | 1.42E-01 | 3 | 1.47E-03 |
| tALPS | MAPT | 17 | 44064461 | rs6205554 | 43964539 | Astrocytes | -0.010 | 0.002 | 1.16E-09 | 0.502 | 0.071 | 1.98E-12 | -0.020 | 0.004 | 4.16E-06 | 4.93E-01 | 3 | 2.47E-04 |

Supplementary Table 15. Cell-type and brain pathology-region specific genetic enrichment analysis for ALPS-derived phenotypes and neuropsychiatric traits using the GSMAP method. The table presents results from a Cauchy combination test, which aggregates signals across multiple GWAS summary statistics to identify enriched gene sets in specific cell types or brain regions.

A significant genetic enrichment was defined as a p_{cauchy} value less than the stringent threshold of 5.00×10^{-7} , which accounts for multiple testing across all cell types and brain regions examined. This threshold is more conservative than genome-wide significance and highlights robust associations.

Abbreviations: ALPS, Along the Perivascular Space Index; aALPS, anterior ALPS; mALPS, middle ALPS; pALPS, posterior ALPS; tALPS, total ALPS; Left/Right/Mean_ALPS, hemispheric ALPS indices; AD, Alzheimer's Disease; Insomnia, Insomnia Disorder; ex, excitatory neurons; in, inhibitory neurons; ast, astrocytes; oli, oligodendrocytes; opc, oligodendrocyte precursor cells; mic, microglia; Ab, amyloid- β pathology regions; pTau, phosphorylated tau pathology regions; both, co-occurring Ab and pTau pathology regions; n_Ab/n_pTau/n_both, regions adjacent to corresponding pathology areas; none, non-pathology control regions.

| Trait | Tissue/Cell Type | p_{cauchy} | p_{median} |
|-----------|------------------|---------------------|---------------------|
| aALPS | ex | 9.60E-64 | 0.538 |
| aALPS | ast | 1.77E-32 | 0.487 |
| aALPS | opc | 8.94E-23 | 0.466 |
| aALPS | in | 6.59E-18 | 0.537 |
| aALPS | mic | 1.50E-17 | 0.536 |
| aALPS | oli | 1.00E+00 | 0.194 |
| aALPS | pTau | 9.14E-85 | 0.409 |
| aALPS | none | 4.91E-59 | 0.598 |
| aALPS | n_pTau | 7.57E-44 | 0.399 |
| aALPS | Ab | 9.99E-16 | 0.612 |
| aALPS | both | 4.63E-07 | 0.427 |
| aALPS | n_both | 2.44E-03 | 0.195 |
| aALPS | n_Ab | 1.00E+00 | 0.505 |
| AD | mic | 8.49E-259 | 0.625 |
| AD | ast | 1.00E+00 | 0.620 |
| AD | ex | 1.00E+00 | 0.494 |
| AD | oli | 1.00E+00 | 0.762 |
| AD | in | 1.00E+00 | 0.607 |
| AD | opc | 1.00E+00 | 0.627 |
| AD | n_Ab | 2.24E-185 | 0.535 |
| AD | pTau | 1.76E-183 | 0.602 |
| AD | both | 1.54E-61 | 0.646 |
| AD | Ab | 3.50E-26 | 0.607 |
| AD | n_both | 6.26E-25 | 0.622 |
| AD | none | 1.00E+00 | 0.417 |
| AD | n_pTau | 1.00E+00 | 0.644 |
| Left_ALPS | ast | 1.00E+00 | 0.840 |
| Left_ALPS | oli | 1.00E+00 | 0.842 |
| Left_ALPS | ex | 1.00E+00 | 0.838 |
| Left_ALPS | in | 1.00E+00 | 0.840 |
| Left_ALPS | mic | 1.00E+00 | 0.842 |

| | | | |
|------------|--------|----------|-------|
| Left_ALPS | opc | 1.00E+00 | 0.840 |
| Left_ALPS | Ab | 1.39E-14 | 0.842 |
| Left_ALPS | both | 9.22E-01 | 0.836 |
| Left_ALPS | n_both | 1.00E+00 | 0.550 |
| Left_ALPS | none | 1.00E+00 | 0.840 |
| Left_ALPS | n_pTau | 1.00E+00 | 0.837 |
| Left_ALPS | pTau | 1.00E+00 | 0.838 |
| Left_ALPS | n_Ab | 1.00E+00 | 0.842 |
| mALPS | ast | 1.00E+00 | 0.795 |
| mALPS | oli | 1.00E+00 | 0.838 |
| mALPS | ex | 1.00E+00 | 0.785 |
| mALPS | in | 1.00E+00 | 0.794 |
| mALPS | mic | 1.00E+00 | 0.831 |
| mALPS | opc | 1.00E+00 | 0.795 |
| mALPS | Ab | 7.92E-01 | 0.804 |
| mALPS | none | 1.00E+00 | 0.820 |
| mALPS | both | 1.00E+00 | 0.799 |
| mALPS | pTau | 1.00E+00 | 0.771 |
| mALPS | n_pTau | 1.00E+00 | 0.563 |
| mALPS | n_Ab | 1.00E+00 | 0.838 |
| mALPS | n_both | 1.00E+00 | 0.392 |
| Mean_ALPS | ast | 1.00E+00 | 0.839 |
| Mean_ALPS | oli | 1.00E+00 | 0.839 |
| Mean_ALPS | ex | 1.00E+00 | 0.835 |
| Mean_ALPS | in | 1.00E+00 | 0.839 |
| Mean_ALPS | mic | 1.00E+00 | 0.842 |
| Mean_ALPS | opc | 1.00E+00 | 0.839 |
| Mean_ALPS | Ab | 7.74E-06 | 0.842 |
| Mean_ALPS | both | 9.62E-01 | 0.834 |
| Mean_ALPS | pTau | 1.00E+00 | 0.835 |
| Mean_ALPS | none | 1.00E+00 | 0.839 |
| Mean_ALPS | n_pTau | 1.00E+00 | 0.834 |
| Mean_ALPS | n_Ab | 1.00E+00 | 0.842 |
| Mean_ALPS | n_both | 1.00E+00 | 0.510 |
| pALPS | ast | 1.00E+00 | 0.834 |
| pALPS | oli | 1.00E+00 | 0.835 |
| pALPS | ex | 1.00E+00 | 0.834 |
| pALPS | in | 1.00E+00 | 0.840 |
| pALPS | mic | 1.00E+00 | 0.835 |
| pALPS | opc | 1.00E+00 | 0.842 |
| pALPS | none | 1.00E+00 | 0.821 |
| pALPS | pTau | 1.00E+00 | 0.842 |
| pALPS | both | 1.00E+00 | 0.835 |
| pALPS | n_pTau | 1.00E+00 | 0.842 |
| pALPS | n_Ab | 1.00E+00 | 0.834 |
| pALPS | n_both | 1.00E+00 | 0.842 |
| pALPS | Ab | 1.00E+00 | 0.821 |
| Right_ALPS | ast | 1.00E+00 | 0.837 |
| Right_ALPS | oli | 1.00E+00 | 0.837 |

| | | | |
|------------|--------|----------|-------|
| Right_ALPS | ex | 1.00E+00 | 0.837 |
| Right_ALPS | in | 1.00E+00 | 0.842 |
| Right_ALPS | mic | 1.00E+00 | 0.842 |
| Right_ALPS | opc | 1.00E+00 | 0.836 |
| Right_ALPS | none | 1.00E+00 | 0.842 |
| Right_ALPS | pTau | 1.00E+00 | 0.837 |
| Right_ALPS | both | 1.00E+00 | 0.797 |
| Right_ALPS | n_pTau | 1.00E+00 | 0.826 |
| Right_ALPS | n_Ab | 1.00E+00 | 0.842 |
| Right_ALPS | n_both | 1.00E+00 | 0.662 |
| Right_ALPS | Ab | 1.00E+00 | 0.842 |
| tALPS | ast | 8.94E-10 | 0.807 |
| tALPS | in | 1.00E+00 | 0.795 |
| tALPS | mic | 1.00E+00 | 0.812 |
| tALPS | opc | 1.00E+00 | 0.807 |
| tALPS | ex | 1.00E+00 | 0.781 |
| tALPS | oli | 1.00E+00 | 0.816 |
| tALPS | both | 6.39E-01 | 0.810 |
| tALPS | Ab | 7.75E-01 | 0.801 |
| tALPS | n_pTau | 9.99E-01 | 0.674 |
| tALPS | n_both | 1.00E+00 | 0.481 |
| tALPS | none | 1.00E+00 | 0.801 |
| tALPS | pTau | 1.00E+00 | 0.776 |
| tALPS | n_Ab | 1.00E+00 | 0.817 |
| Insomnia | ast | 1.00E+00 | 0.844 |
| Insomnia | oli | 1.00E+00 | 0.812 |
| Insomnia | ex | 1.00E+00 | 0.843 |
| Insomnia | in | 1.00E+00 | 0.852 |
| Insomnia | mic | 1.00E+00 | 0.852 |
| Insomnia | opc | 1.00E+00 | 0.844 |
| Insomnia | both | 9.07E-01 | 0.818 |
| Insomnia | none | 1.00E+00 | 0.840 |
| Insomnia | pTau | 1.00E+00 | 0.854 |
| Insomnia | n_pTau | 1.00E+00 | 0.855 |
| Insomnia | n_Ab | 1.00E+00 | 0.834 |
| Insomnia | n_both | 1.00E+00 | 0.852 |
| Insomnia | Ab | 1.00E+00 | 0.829 |

Supplementary Table 16. Tissue enrichment analysis for shared genetic mechanisms between insomnia and ALPS subtypes using the PCGA method.

| Trait | Tissue/Cell Type | Category | P-value | P_adj |
|---------------------|--|----------------|----------|----------|
| Insomnia-Left_ALPS | Brain - Hippocampus | Nervous system | 2.91E-18 | 1.57E-16 |
| Insomnia-Left_ALPS | Brain - Amygdala | Nervous system | 5.32E-18 | 2.87E-16 |
| Insomnia-Right_ALPS | Brain - Frontal Cortex (BA9) | Nervous system | 9.68E-18 | 5.23E-16 |
| Insomnia-Left_ALPS | Brain - Frontal Cortex (BA9) | Nervous system | 1.39E-17 | 7.51E-16 |
| Insomnia-Right_ALPS | Brain - Hippocampus | Nervous system | 3.25E-17 | 1.76E-15 |
| Insomnia-Mean_ALPS | Brain - Hippocampus | Nervous system | 4.51E-17 | 2.44E-15 |
| Insomnia-Left_ALPS | Brain - Hypothalamus | Nervous system | 5.43E-17 | 2.93E-15 |
| Insomnia-Mean_ALPS | Brain - Frontal Cortex (BA9) | Nervous system | 6.71E-17 | 3.62E-15 |
| Insomnia-Right_ALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 7.42E-17 | 4.01E-15 |
| Insomnia-Left_ALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 1.00E-16 | 5.40E-15 |
| Insomnia-Left_ALPS | Brain - Caudate (basal ganglia) | Nervous system | 1.33E-16 | 7.18E-15 |
| Insomnia-Mean_ALPS | Brain - Amygdala | Nervous system | 1.55E-16 | 8.37E-15 |
| Insomnia-aALPS | Brain - Hippocampus | Nervous system | 1.97E-16 | 1.06E-14 |
| Insomnia-tALPS | Brain - Hippocampus | Nervous system | 2.00E-16 | 1.08E-14 |
| Insomnia-Right_ALPS | Brain - Amygdala | Nervous system | 2.05E-16 | 1.11E-14 |
| Insomnia-pALPS | Brain - Hippocampus | Nervous system | 2.43E-16 | 1.31E-14 |
| Insomnia-Mean_ALPS | Brain - Putamen (basal ganglia) | Nervous system | 3.16E-16 | 1.71E-14 |
| Insomnia-Right_ALPS | Brain - Putamen (basal ganglia) | Nervous system | 3.45E-16 | 1.86E-14 |
| Insomnia-aALPS | Brain - Frontal Cortex (BA9) | Nervous system | 4.91E-16 | 2.65E-14 |
| Insomnia-aALPS | Brain - Putamen (basal ganglia) | Nervous system | 7.38E-16 | 3.99E-14 |
| Insomnia-Mean_ALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 7.38E-16 | 3.99E-14 |
| Insomnia-pALPS | Brain - Frontal Cortex (BA9) | Nervous system | 8.10E-16 | 4.37E-14 |
| Insomnia-aALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 8.13E-16 | 4.39E-14 |
| Insomnia-Left_ALPS | Brain - Putamen (basal ganglia) | Nervous system | 1.20E-15 | 6.48E-14 |
| Insomnia-pALPS | Brain - Amygdala | Nervous system | 1.23E-15 | 6.64E-14 |
| Insomnia-mALPS | Brain - Hippocampus | Nervous system | 1.78E-15 | 9.61E-14 |
| Insomnia-Left_ALPS | Brain - Substantia nigra | Nervous system | 2.19E-15 | 1.18E-13 |
| Insomnia-pALPS | Brain - Caudate (basal ganglia) | Nervous system | 2.39E-15 | 1.29E-13 |
| Insomnia-aALPS | Brain - Nucleus accumbens (basal | Nervous system | 2.66E-15 | 1.44E-13 |
| Insomnia-Right_ALPS | Brain - Caudate (basal ganglia) | Nervous system | 2.87E-15 | 1.55E-13 |
| Insomnia-Right_ALPS | Brain - Substantia nigra | Nervous system | 3.14E-15 | 1.70E-13 |
| Insomnia-Mean_ALPS | Brain - Caudate (basal ganglia) | Nervous system | 3.19E-15 | 1.72E-13 |
| Insomnia-Left_ALPS | Brain - Nucleus accumbens (basal | Nervous system | 3.22E-15 | 1.74E-13 |
| Insomnia-pALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 4.08E-15 | 2.20E-13 |
| Insomnia-tALPS | Brain - Caudate (basal ganglia) | Nervous system | 4.74E-15 | 2.56E-13 |
| Insomnia-Mean_ALPS | Brain - Substantia nigra | Nervous system | 6.77E-15 | 3.66E-13 |
| Insomnia-aALPS | Brain - Amygdala | Nervous system | 7.49E-15 | 4.04E-13 |
| Insomnia-aALPS | Brain - Caudate (basal ganglia) | Nervous system | 7.86E-15 | 4.24E-13 |
| Insomnia-tALPS | Brain - Putamen (basal ganglia) | Nervous system | 7.88E-15 | 4.26E-13 |
| Insomnia-pALPS | Brain - Putamen (basal ganglia) | Nervous system | 7.95E-15 | 4.29E-13 |
| Insomnia-mALPS | Brain - Frontal Cortex (BA9) | Nervous system | 8.85E-15 | 4.78E-13 |
| Insomnia-tALPS | Brain - Amygdala | Nervous system | 9.71E-15 | 5.24E-13 |
| Insomnia-mALPS | Brain - Putamen (basal ganglia) | Nervous system | 9.79E-15 | 5.29E-13 |
| Insomnia-mALPS | Brain - Caudate (basal ganglia) | Nervous system | 1.38E-14 | 7.45E-13 |

| | | | | |
|---------------------|--|------------------|----------|----------|
| Insomnia-mALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 1.44E-14 | 7.78E-13 |
| Insomnia-Right_ALPS | Brain - Hypothalamus | Nervous system | 1.63E-14 | 8.80E-13 |
| Insomnia-pALPS | Brain - Nucleus accumbens (basal | Nervous system | 1.66E-14 | 8.96E-13 |
| Insomnia-Mean_ALPS | Brain - Hypothalamus | Nervous system | 2.55E-14 | 1.38E-12 |
| Insomnia-Right_ALPS | Brain - Nucleus accumbens (basal | Nervous system | 2.56E-14 | 1.38E-12 |
| Insomnia-mALPS | Brain - Amygdala | Nervous system | 2.74E-14 | 1.48E-12 |
| Insomnia-mALPS | Brain - Nucleus accumbens (basal | Nervous system | 2.87E-14 | 1.55E-12 |
| Insomnia-tALPS | Brain - Hypothalamus | Nervous system | 3.48E-14 | 1.88E-12 |
| Insomnia-Right_ALPS | Brain - Cortex | Nervous system | 4.08E-14 | 2.20E-12 |
| Insomnia-tALPS | Brain - Frontal Cortex (BA9) | Nervous system | 5.43E-14 | 2.93E-12 |
| Insomnia-tALPS | Brain - Nucleus accumbens (basal | Nervous system | 5.99E-14 | 3.23E-12 |
| Insomnia-mALPS | Brain - Hypothalamus | Nervous system | 8.33E-14 | 4.50E-12 |
| Insomnia-aALPS | Brain - Hypothalamus | Nervous system | 1.08E-13 | 5.83E-12 |
| Insomnia-Mean_ALPS | Brain - Cortex | Nervous system | 1.09E-13 | 5.89E-12 |
| Insomnia-Mean_ALPS | Brain - Nucleus accumbens (basal | Nervous system | 1.13E-13 | 6.10E-12 |
| Insomnia-tALPS | Brain - Anterior cingulate cortex (BA24) | Nervous system | 1.83E-13 | 9.88E-12 |
| Insomnia-Left_ALPS | Brain - Cortex | Nervous system | 2.53E-13 | 1.37E-11 |
| Insomnia-tALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 2.61E-13 | 1.41E-11 |
| Insomnia-Left_ALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 3.94E-13 | 2.13E-11 |
| Insomnia-Right_ALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 4.91E-13 | 2.65E-11 |
| Insomnia-pALPS | Brain - Hypothalamus | Nervous system | 5.21E-13 | 2.81E-11 |
| Insomnia-tALPS | Brain - Substantia nigra | Nervous system | 6.83E-13 | 3.69E-11 |
| Insomnia-pALPS | Brain - Cortex | Nervous system | 1.13E-12 | 6.10E-11 |
| Insomnia-pALPS | Brain - Substantia nigra | Nervous system | 1.22E-12 | 6.59E-11 |
| Insomnia-aALPS | Brain - Cortex | Nervous system | 1.55E-12 | 8.37E-11 |
| Insomnia-Mean_ALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 1.82E-12 | 9.83E-11 |
| Insomnia-aALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 2.24E-12 | 1.21E-10 |
| Insomnia-aALPS | Brain - Substantia nigra | Nervous system | 4.21E-12 | 2.27E-10 |
| Insomnia-mALPS | Brain - Substantia nigra | Nervous system | 4.35E-12 | 2.35E-10 |
| Insomnia-mALPS | Brain - Cortex | Nervous system | 7.39E-12 | 3.99E-10 |
| Insomnia-pALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 3.32E-11 | 1.79E-09 |
| Insomnia-mALPS | Brain - Spinal cord (cervical c-1) | Nervous system | 4.31E-11 | 2.33E-09 |
| Insomnia-tALPS | Brain - Cortex | Nervous system | 6.65E-11 | 3.59E-09 |
| Insomnia-pALPS | Colon - Sigmoid | Digestive system | 5.67E-09 | 3.06E-07 |
| Insomnia-mALPS | Brain - Cerebellar Hemisphere | Nervous system | 3.82E-08 | 2.06E-06 |
| Insomnia-Left_ALPS | Brain - Cerebellar Hemisphere | Nervous system | 7.94E-08 | 4.29E-06 |
| Insomnia-Right_ALPS | Brain - Cerebellar Hemisphere | Nervous system | 1.65E-07 | 8.91E-06 |
| Insomnia-tALPS | Colon - Sigmoid | Digestive system | 2.52E-07 | 1.36E-05 |
| Insomnia-Mean_ALPS | Colon - Sigmoid | Digestive system | 2.70E-07 | 1.46E-05 |
| Insomnia-Mean_ALPS | Brain - Cerebellar Hemisphere | Nervous system | 7.55E-07 | 4.08E-05 |
| Insomnia-aALPS | Brain - Cerebellar Hemisphere | Nervous system | 8.44E-07 | 4.56E-05 |
| Insomnia-pALPS | Brain - Cerebellar Hemisphere | Nervous system | 1.02E-06 | 5.51E-05 |
| Insomnia-tALPS | Brain - Cerebellar Hemisphere | Nervous system | 1.03E-06 | 5.56E-05 |
| Insomnia-mALPS | Colon - Sigmoid | Digestive system | 1.28E-06 | 6.91E-05 |
| Insomnia-mALPS | Brain - Cerebellum | Nervous system | 1.91E-06 | 1.03E-04 |
| Insomnia-tALPS | Pituitary | Endocrine system | 2.70E-06 | 1.46E-04 |
| Insomnia-pALPS | Esophagus - Gastroesophageal Junction | Digestive system | 2.99E-06 | 1.61E-04 |

| | | | | |
|---------------------|---------------------------------------|-----------------------|----------|----------|
| Insomnia-Mean_ALPS | Esophagus - Gastroesophageal Junction | Digestive system | 3.10E-06 | 1.67E-04 |
| Insomnia-Right_ALPS | Colon - Sigmoid | Digestive system | 3.12E-06 | 1.68E-04 |
| Insomnia-mALPS | Pituitary | Endocrine system | 6.10E-06 | 3.29E-04 |
| Insomnia-Left_ALPS | Pituitary | Endocrine system | 7.60E-06 | 4.10E-04 |
| Insomnia-Right_ALPS | Esophagus - Gastroesophageal Junction | Digestive system | 7.83E-06 | 4.23E-04 |
| Insomnia-mALPS | Esophagus - Gastroesophageal Junction | Digestive system | 9.32E-06 | 5.03E-04 |
| Insomnia-Right_ALPS | Brain - Cerebellum | Nervous system | 9.83E-06 | 5.31E-04 |
| Insomnia-pALPS | Esophagus - Muscularis | Digestive system | 1.13E-05 | 6.10E-04 |
| Insomnia-Left_ALPS | Brain - Cerebellum | Nervous system | 1.15E-05 | 6.21E-04 |
| Insomnia-tALPS | Esophagus - Gastroesophageal Junction | Digestive system | 1.27E-05 | 6.86E-04 |
| Insomnia-pALPS | Brain - Cerebellum | Nervous system | 1.33E-05 | 7.18E-04 |
| Insomnia-Left_ALPS | Colon - Sigmoid | Digestive system | 1.62E-05 | 8.75E-04 |
| Insomnia-Right_ALPS | Esophagus - Muscularis | Digestive system | 1.63E-05 | 8.80E-04 |
| Insomnia-aALPS | Brain - Cerebellum | Nervous system | 1.96E-05 | 1.06E-03 |
| Insomnia-tALPS | Brain - Cerebellum | Nervous system | 2.06E-05 | 1.11E-03 |
| Insomnia-Right_ALPS | Pituitary | Endocrine system | 2.17E-05 | 1.17E-03 |
| Insomnia-Mean_ALPS | Esophagus - Muscularis | Digestive system | 2.74E-05 | 1.48E-03 |
| Insomnia-Mean_ALPS | Brain - Cerebellum | Nervous system | 2.85E-05 | 1.54E-03 |
| Insomnia-mALPS | Esophagus - Muscularis | Digestive system | 4.03E-05 | 2.18E-03 |
| Insomnia-aALPS | Pituitary | Endocrine system | 5.29E-05 | 2.86E-03 |
| Insomnia-Mean_ALPS | Pituitary | Endocrine system | 6.26E-05 | 3.38E-03 |
| Insomnia-aALPS | Colon - Sigmoid | Digestive system | 6.29E-05 | 3.40E-03 |
| Insomnia-tALPS | Esophagus - Muscularis | Digestive system | 9.05E-05 | 4.89E-03 |
| Insomnia-Left_ALPS | Esophagus - Gastroesophageal Junction | Digestive system | 2.22E-04 | 1.20E-02 |
| Insomnia-pALPS | Pituitary | Endocrine system | 7.06E-04 | 3.81E-02 |
| Insomnia-pALPS | Artery - Tibial | Cardiovascular system | 8.68E-04 | 4.69E-02 |

Supplementary Table 17. Cell Type enrichment analysis for shared genetic mechanisms between insomnia and ALPS subtypes using the PCGA method.

| Trait | Tissue/Cell Type | Category | Source organ | P-value | P_adj |
|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.47E-27 | 6.06E-25 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.36E-26 | 5.60E-24 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.24E-26 | 9.23E-24 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.76E-26 | 1.55E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.43E-26 | 1.83E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.12E-26 | 2.52E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.50E-26 | 3.09E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.28E-25 | 5.27E-23 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.41E-25 | 5.81E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.47E-25 | 6.06E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.86E-25 | 7.66E-23 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.50E-25 | 1.03E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.75E-25 | 1.13E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.83E-25 | 1.58E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.98E-25 | 1.64E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.06E-25 | 1.67E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.25E-25 | 1.75E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.37E-25 | 1.80E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.49E-25 | 1.85E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.57E-25 | 1.88E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.75E-25 | 2.37E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.34E-25 | 2.61E-22 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.42E-25 | 2.81E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.77E-25 | 4.03E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.03E-24 | 4.24E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.12E-24 | 4.61E-22 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.07E-24 | 4.69E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-24 | 4.86E-22 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.24E-24 | 5.43E-22 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.42E-24 | 5.85E-22 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.67E-24 | 7.31E-22 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.89E-24 | 8.28E-22 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.22E-24 | 9.15E-22 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.75E-24 | 1.20E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.93E-24 | 1.21E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.08E-24 | 1.27E-21 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.48E-24 | 1.52E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.75E-24 | 1.55E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.94E-24 | 1.62E-21 |

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|-------------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.23E-24 | 1.85E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.20E-24 | 2.14E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.32E-24 | 2.19E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.14E-24 | 2.25E-21 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.09E-24 | 2.30E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.34E-24 | 2.34E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.83E-24 | 2.40E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.88E-24 | 2.42E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.52E-24 | 2.69E-21 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.30E-24 | 2.76E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.99E-24 | 3.06E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.96E-24 | 3.28E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.54E-24 | 3.52E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.60E-24 | 3.54E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.21E-24 | 3.79E-21 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.02E-23 | 4.47E-21 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.15E-23 | 5.04E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.29E-23 | 5.31E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.36E-23 | 5.60E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.28E-23 | 5.61E-21 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.39E-23 | 6.09E-21 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.41E-23 | 6.18E-21 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.58E-23 | 6.51E-21 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.50E-23 | 6.57E-21 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.51E-23 | 6.61E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.51E-23 | 6.61E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.92E-23 | 7.91E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.95E-23 | 8.03E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.87E-23 | 8.19E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.88E-23 | 8.23E-21 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.90E-23 | 8.32E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.11E-23 | 8.69E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.00E-23 | 8.76E-21 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.00E-23 | 8.76E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.18E-23 | 8.98E-21 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.11E-23 | 9.24E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.38E-23 | 9.81E-21 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.26E-23 | 9.90E-21 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.49E-23 | 1.03E-20 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.95E-23 | 1.29E-20 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.17E-23 | 1.39E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.26E-23 | 1.43E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.39E-23 | 1.48E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.67E-23 | 1.51E-20 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.48E-23 | 1.52E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.51E-23 | 1.54E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.74E-23 | 1.54E-20 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.60E-23 | 2.01E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.04E-23 | 2.08E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.89E-23 | 2.14E-20 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.17E-23 | 2.26E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.50E-23 | 2.27E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.27E-23 | 2.31E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.44E-23 | 2.38E-20 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.84E-23 | 2.41E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.05E-23 | 2.49E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.70E-23 | 2.50E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.05E-23 | 2.65E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.25E-23 | 2.74E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.89E-23 | 2.84E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.40E-23 | 3.24E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.85E-23 | 3.44E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.88E-23 | 3.45E-20 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.10E-23 | 3.55E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.47E-23 | 3.71E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.61E-23 | 3.96E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.01E-22 | 4.16E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.03E-22 | 4.24E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.71E-23 | 4.25E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.94E-23 | 4.35E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.07E-22 | 4.41E-20 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.01E-22 | 4.42E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.08E-22 | 4.45E-20 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.02E-22 | 4.47E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.10E-22 | 4.53E-20 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.06E-22 | 4.64E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.08E-22 | 4.73E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.12E-22 | 4.91E-20 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.14E-22 | 4.99E-20 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.34E-22 | 5.52E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.36E-22 | 5.60E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.29E-22 | 5.65E-20 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.32E-22 | 5.78E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.41E-22 | 5.81E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.33E-22 | 5.83E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.35E-22 | 5.91E-20 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.36E-22 | 5.96E-20 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.33E-22 | 6.01E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.47E-22 | 6.06E-20 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.51E-22 | 6.22E-20 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.56E-22 | 6.43E-20 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.59E-22 | 6.96E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.63E-22 | 7.14E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.63E-22 | 7.14E-20 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.79E-22 | 7.37E-20 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.67E-22 | 7.55E-20 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.75E-22 | 7.67E-20 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.78E-22 | 7.80E-20 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.80E-22 | 7.88E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.80E-22 | 7.88E-20 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.89E-22 | 8.28E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.94E-22 | 8.50E-20 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.98E-22 | 8.67E-20 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.00E-22 | 8.76E-20 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.13E-22 | 9.33E-20 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.17E-22 | 9.50E-20 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.22E-22 | 9.72E-20 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.51E-22 | 1.03E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.43E-22 | 1.06E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.75E-22 | 1.13E-19 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.74E-22 | 1.20E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.82E-22 | 1.24E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.76E-22 | 1.25E-19 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.06E-22 | 1.34E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.34E-22 | 1.38E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.34E-22 | 1.38E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.39E-22 | 1.40E-19 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 3.26E-22 | 1.43E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.34E-22 | 1.46E-19 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.35E-22 | 1.47E-19 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.36E-22 | 1.47E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.40E-22 | 1.49E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.40E-22 | 1.49E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.48E-22 | 1.52E-19 |
| Insomnia-aALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 3.70E-22 | 1.52E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.54E-22 | 1.55E-19 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.80E-22 | 1.57E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.98E-22 | 1.64E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.05E-22 | 1.67E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.00E-22 | 1.75E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.29E-22 | 1.88E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.88E-22 | 2.01E-19 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.90E-22 | 2.02E-19 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.93E-22 | 2.16E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.50E-22 | 2.27E-19 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.82E-22 | 2.40E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.91E-22 | 2.43E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.60E-22 | 2.45E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.78E-22 | 2.53E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.16E-22 | 2.70E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.37E-22 | 2.79E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.38E-22 | 2.79E-19 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.70E-22 | 2.93E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.71E-22 | 2.94E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.75E-22 | 2.96E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.36E-22 | 3.03E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.83E-22 | 3.09E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.22E-22 | 3.16E-19 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.66E-22 | 3.36E-19 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.68E-22 | 3.36E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.90E-22 | 3.46E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.51E-22 | 3.51E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.79E-22 | 3.62E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.10E-22 | 3.75E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.13E-22 | 3.76E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.14E-22 | 3.77E-19 |

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|----------------|-------------------|------------|----------------------|----------|----------|
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 8.67E-22 | 3.80E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.69E-22 | 3.81E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.79E-22 | 3.85E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.64E-22 | 3.97E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.65E-22 | 3.98E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 9.10E-22 | 3.99E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.91E-22 | 4.03E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.21E-22 | 4.03E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.21E-22 | 4.03E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.12E-22 | 4.12E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 9.48E-22 | 4.15E-19 |
| Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.48E-22 | 4.15E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.76E-22 | 4.27E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 9.92E-22 | 4.34E-19 |
| Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.92E-22 | 4.34E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.02E-21 | 4.47E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.09E-21 | 4.49E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.03E-21 | 4.51E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.05E-21 | 4.60E-19 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.15E-21 | 5.04E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.12E-21 | 5.06E-19 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.17E-21 | 5.12E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-21 | 5.17E-19 |
| Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-21 | 5.17E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-21 | 5.17E-19 |
| Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-21 | 5.17E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.22E-21 | 5.34E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.22E-21 | 5.34E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.22E-21 | 5.34E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.22E-21 | 5.34E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.25E-21 | 5.48E-19 |
| Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.25E-21 | 5.48E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.26E-21 | 5.52E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.26E-21 | 5.52E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.26E-21 | 5.52E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.25E-21 | 5.65E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.32E-21 | 5.78E-19 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.31E-21 | 5.92E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.37E-21 | 6.00E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.37E-21 | 6.00E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.49E-21 | 6.14E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.37E-21 | 6.19E-19 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.45E-21 | 6.35E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.52E-21 | 6.66E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-21 | 6.75E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-21 | 6.75E-19 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-21 | 6.75E-19 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-21 | 6.75E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.68E-21 | 6.92E-19 |

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| Insomnia-Right_ALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 1.60E-21 | 7.01E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.58E-21 | 7.14E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.65E-21 | 7.23E-19 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.65E-21 | 7.23E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.63E-21 | 7.37E-19 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.72E-21 | 7.53E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.75E-21 | 7.67E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.88E-21 | 7.75E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.84E-21 | 8.06E-19 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.87E-21 | 8.19E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.89E-21 | 8.28E-19 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.03E-21 | 8.36E-19 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.92E-21 | 8.41E-19 |
| Insomnia-Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.95E-21 | 8.54E-19 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.96E-21 | 8.58E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.98E-21 | 8.67E-19 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.02E-21 | 8.85E-19 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.07E-21 | 9.36E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.15E-21 | 9.42E-19 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.16E-21 | 9.46E-19 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.18E-21 | 9.55E-19 |
| Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.29E-21 | 1.00E-18 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.38E-21 | 1.04E-18 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.38E-21 | 1.04E-18 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.55E-21 | 1.05E-18 |
| Insomnia-tALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 2.42E-21 | 1.06E-18 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.44E-21 | 1.07E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.45E-21 | 1.07E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.45E-21 | 1.07E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.40E-21 | 1.08E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.67E-21 | 1.10E-18 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.49E-21 | 1.13E-18 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.59E-21 | 1.13E-18 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.68E-21 | 1.17E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.84E-21 | 1.24E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.10E-21 | 1.28E-18 |

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| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.99E-21 | 1.31E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.00E-21 | 1.36E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.32E-21 | 1.37E-18 |
| Insomnia- Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.22E-21 | 1.41E-18 |
| Insomnia- Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.26E-21 | 1.43E-18 |
| Insomnia- Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.39E-21 | 1.48E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.42E-21 | 1.50E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.46E-21 | 1.52E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.73E-21 | 1.54E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.52E-21 | 1.54E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.79E-21 | 1.56E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.63E-21 | 1.59E-18 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.72E-21 | 1.63E-18 |
| Insomnia- Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.73E-21 | 1.63E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.67E-21 | 1.66E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.81E-21 | 1.67E-18 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.81E-21 | 1.67E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.88E-21 | 1.70E-18 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.93E-21 | 1.72E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.97E-21 | 1.74E-18 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.06E-21 | 1.78E-18 |
| Insomnia-mALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 4.53E-21 | 1.98E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.53E-21 | 1.98E-18 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.54E-21 | 1.99E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.54E-21 | 1.99E-18 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.79E-21 | 2.10E-18 |
| Insomnia- Insomnia- Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.91E-21 | 2.15E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.91E-21 | 2.15E-18 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.98E-21 | 2.18E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.28E-21 | 2.31E-18 |
| Insomnia- Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.46E-21 | 2.39E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.81E-21 | 2.54E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.21E-21 | 2.72E-18 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.62E-21 | 2.73E-18 |
| Insomnia- Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.24E-21 | 2.73E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.47E-21 | 2.83E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.53E-21 | 2.86E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.78E-21 | 2.97E-18 |

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| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.88E-21 | 3.01E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.93E-21 | 3.04E-18 |
| Insomnia- Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.69E-21 | 3.37E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.96E-21 | 3.49E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.98E-21 | 3.50E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.04E-21 | 3.52E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.12E-21 | 3.56E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.29E-21 | 3.63E-18 |
| Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.46E-21 | 3.71E-18 |
| Insomnia- Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.47E-21 | 3.71E-18 |
| Insomnia- Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.04E-21 | 3.72E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.53E-21 | 3.74E-18 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.64E-21 | 3.78E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.73E-21 | 3.82E-18 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.36E-21 | 3.86E-18 |
| Insomnia- Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.89E-21 | 3.89E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.08E-21 | 3.98E-18 |
| Insomnia- Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.24E-21 | 4.05E-18 |
| Insomnia- Insomnia- Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.31E-21 | 4.08E-18 |
| Insomnia- Insomnia- Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.31E-21 | 4.08E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.46E-21 | 4.14E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.26E-21 | 4.19E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.03E-20 | 4.24E-18 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.01E-20 | 4.42E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.01E-20 | 4.42E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.00E-20 | 4.52E-18 |
| Insomnia- Insomnia- Insomnia- Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.04E-20 | 4.56E-18 |
| Insomnia- Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.09E-20 | 4.77E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.07E-20 | 4.84E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.12E-20 | 4.91E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.14E-20 | 4.99E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.14E-20 | 4.99E-18 |
| Insomnia- Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.15E-20 | 5.04E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.15E-20 | 5.04E-18 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.14E-20 | 5.15E-18 |
| Insomnia- Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.24E-20 | 5.43E-18 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.21E-20 | 5.47E-18 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.38E-20 | 5.69E-18 |

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| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.30E-20 | 5.69E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.32E-20 | 5.78E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.35E-20 | 5.91E-18 |
| Insomnia-aALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 1.57E-20 | 6.47E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.45E-20 | 6.55E-18 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.50E-20 | 6.57E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.63E-20 | 6.72E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.49E-20 | 6.73E-18 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.54E-20 | 6.75E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.55E-20 | 6.79E-18 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.66E-20 | 6.84E-18 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.52E-20 | 6.87E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.58E-20 | 6.92E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.62E-20 | 7.10E-18 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.66E-20 | 7.27E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.74E-20 | 7.62E-18 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.75E-20 | 7.67E-18 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.93E-20 | 8.45E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.96E-20 | 8.58E-18 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.99E-20 | 8.72E-18 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.99E-20 | 8.72E-18 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 2.02E-20 | 8.85E-18 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 2.05E-20 | 8.98E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.07E-20 | 9.07E-18 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.08E-20 | 9.11E-18 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 2.11E-20 | 9.24E-18 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.12E-20 | 9.29E-18 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.09E-20 | 9.45E-18 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.25E-20 | 9.86E-18 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.29E-20 | 1.00E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.30E-20 | 1.01E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.39E-20 | 1.05E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.46E-20 | 1.11E-17 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 2.57E-20 | 1.13E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.60E-20 | 1.14E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.65E-20 | 1.16E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.73E-20 | 1.20E-17 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.82E-20 | 1.24E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.87E-20 | 1.26E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.93E-20 | 1.28E-17 |

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| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.09E-20 | 1.35E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.17E-20 | 1.39E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.21E-20 | 1.41E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.21E-20 | 1.41E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.28E-20 | 1.44E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.38E-20 | 1.48E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.40E-20 | 1.49E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.43E-20 | 1.50E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.45E-20 | 1.51E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.40E-20 | 1.54E-17 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.79E-20 | 1.56E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.59E-20 | 1.57E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.61E-20 | 1.58E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.66E-20 | 1.60E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.70E-20 | 1.62E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.95E-20 | 1.73E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.90E-20 | 1.76E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.03E-20 | 1.77E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.12E-20 | 1.80E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.14E-20 | 1.81E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.24E-20 | 1.86E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.15E-20 | 1.88E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.32E-20 | 1.89E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.60E-20 | 2.01E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.68E-20 | 2.05E-17 |
| Insomnia-Right_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 4.75E-20 | 2.08E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.88E-20 | 2.14E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.89E-20 | 2.14E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.06E-20 | 2.22E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.11E-20 | 2.24E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.14E-20 | 2.25E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.19E-20 | 2.27E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.40E-20 | 2.37E-17 |
| Insomnia-pALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 5.26E-20 | 2.38E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.47E-20 | 2.40E-17 |

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| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 5.66E-20 | 2.48E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.71E-20 | 2.58E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.95E-20 | 2.61E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.20E-20 | 2.72E-17 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.66E-20 | 2.74E-17 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.41E-20 | 2.81E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.45E-20 | 2.83E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.54E-20 | 2.86E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.71E-20 | 2.94E-17 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.89E-20 | 3.02E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.96E-20 | 3.05E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.97E-20 | 3.05E-17 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.21E-20 | 3.16E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.23E-20 | 3.17E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.30E-20 | 3.20E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.32E-20 | 3.21E-17 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.80E-20 | 3.21E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.34E-20 | 3.21E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.39E-20 | 3.24E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.21E-20 | 3.26E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.48E-20 | 3.28E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.67E-20 | 3.36E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.59E-20 | 3.43E-17 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.96E-20 | 3.49E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.99E-20 | 3.50E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.12E-20 | 3.56E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.25E-20 | 3.61E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.31E-20 | 3.64E-17 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.50E-20 | 3.72E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.53E-20 | 3.74E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.56E-20 | 3.75E-17 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.89E-20 | 3.89E-17 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.46E-20 | 3.90E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.97E-20 | 3.93E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.99E-20 | 3.94E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.16E-20 | 4.01E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.96E-20 | 4.05E-17 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.48E-20 | 4.15E-17 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.49E-20 | 4.16E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.49E-20 | 4.16E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.50E-20 | 4.16E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.71E-20 | 4.25E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.85E-20 | 4.31E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 9.85E-20 | 4.31E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.85E-20 | 4.31E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.91E-20 | 4.34E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.62E-20 | 4.35E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.93E-20 | 4.35E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.00E-19 | 4.38E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.93E-20 | 4.49E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.05E-19 | 4.60E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.05E-19 | 4.75E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.10E-19 | 4.82E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.11E-19 | 4.86E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.12E-19 | 4.91E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.13E-19 | 4.95E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.15E-19 | 5.04E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.16E-19 | 5.08E-17 |
| Insomnia-aALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.24E-19 | 5.11E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.17E-19 | 5.12E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.18E-19 | 5.17E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.19E-19 | 5.21E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.18E-19 | 5.33E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.24E-19 | 5.43E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.25E-19 | 5.48E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.27E-19 | 5.56E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.28E-19 | 5.61E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.35E-19 | 5.91E-17 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.39E-19 | 6.09E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.39E-19 | 6.09E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.41E-19 | 6.18E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.42E-19 | 6.22E-17 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.42E-19 | 6.22E-17 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.43E-19 | 6.26E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.45E-19 | 6.35E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.47E-19 | 6.44E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.48E-19 | 6.48E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.48E-19 | 6.69E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.50E-19 | 6.78E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.56E-19 | 6.83E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.58E-19 | 6.92E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.63E-19 | 7.14E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.65E-19 | 7.23E-17 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.65E-19 | 7.23E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.66E-19 | 7.27E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.66E-19 | 7.27E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.66E-19 | 7.27E-17 |
| Insomnia-Right_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.68E-19 | 7.36E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.68E-19 | 7.36E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.66E-19 | 7.50E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.72E-19 | 7.53E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.74E-19 | 7.62E-17 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.78E-19 | 7.80E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.78E-19 | 7.80E-17 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.75E-19 | 7.91E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.85E-19 | 8.10E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.89E-19 | 8.28E-17 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.92E-19 | 8.41E-17 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 1.93E-19 | 8.45E-17 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.88E-19 | 8.50E-17 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.97E-19 | 8.63E-17 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.98E-19 | 8.67E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.00E-19 | 8.76E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.00E-19 | 8.76E-17 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.01E-19 | 8.80E-17 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.02E-19 | 8.85E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.06E-19 | 9.02E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.08E-19 | 9.11E-17 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.10E-19 | 9.20E-17 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.30E-19 | 9.48E-17 |

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| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.21E-19 | 9.68E-17 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.24E-19 | 9.81E-17 |
| Insomnia-Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.26E-19 | 9.90E-17 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.30E-19 | 1.01E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.36E-19 | 1.03E-16 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.39E-19 | 1.05E-16 |
| Insomnia-Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.42E-19 | 1.06E-16 |
| Insomnia-aALPS | Astrocyte | Nerve cell | Primary motor cortex | 2.62E-19 | 1.08E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.47E-19 | 1.08E-16 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.53E-19 | 1.11E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.46E-19 | 1.11E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.75E-19 | 1.20E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.79E-19 | 1.22E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.80E-19 | 1.23E-16 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.80E-19 | 1.23E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.88E-19 | 1.26E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.88E-19 | 1.26E-16 |
| Insomnia-Insomnia-Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.90E-19 | 1.27E-16 |
| Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.96E-19 | 1.30E-16 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.07E-19 | 1.34E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.04E-19 | 1.37E-16 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.16E-19 | 1.38E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.20E-19 | 1.40E-16 |
| Insomnia-aALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.41E-19 | 1.40E-16 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.27E-19 | 1.48E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.43E-19 | 1.50E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.40E-19 | 1.54E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.51E-19 | 1.54E-16 |
| Insomnia-Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.51E-19 | 1.54E-16 |
| Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.81E-19 | 1.67E-16 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.84E-19 | 1.68E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.86E-19 | 1.69E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.98E-19 | 1.74E-16 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.01E-19 | 1.76E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.23E-19 | 1.85E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.26E-19 | 1.87E-16 |
| Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.26E-19 | 1.87E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.28E-19 | 1.87E-16 |

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| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.34E-19 | 1.90E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.40E-19 | 1.93E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.50E-19 | 1.97E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.59E-19 | 2.01E-16 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.61E-19 | 2.02E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.58E-19 | 2.07E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.73E-19 | 2.07E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.89E-19 | 2.14E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.90E-19 | 2.15E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.95E-19 | 2.17E-16 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.03E-19 | 2.20E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.04E-19 | 2.21E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.14E-19 | 2.25E-16 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.09E-19 | 2.30E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.30E-19 | 2.32E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.35E-19 | 2.34E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.40E-19 | 2.37E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.53E-19 | 2.42E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.61E-19 | 2.46E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.80E-19 | 2.54E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.91E-19 | 2.59E-16 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.97E-19 | 2.61E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.00E-19 | 2.71E-16 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.24E-19 | 2.73E-16 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.28E-19 | 2.75E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.32E-19 | 2.86E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.56E-19 | 2.97E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.85E-19 | 3.00E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.89E-19 | 3.02E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.89E-19 | 3.02E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.99E-19 | 3.06E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 7.06E-19 | 3.09E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.13E-19 | 3.12E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.45E-19 | 3.26E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.67E-19 | 3.36E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.67E-19 | 3.36E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.80E-19 | 3.42E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.80E-19 | 3.42E-16 |

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| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.84E-19 | 3.43E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.82E-19 | 3.53E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.12E-19 | 3.56E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.22E-19 | 3.72E-16 |
| Insomnia-Excitatory neuron | Excitatory neuron | Nerve cell | Primary motor cortex | 8.49E-19 | 3.72E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.93E-19 | 3.91E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.03E-19 | 4.08E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.04E-19 | 4.09E-16 |
| Insomnia-Inhibitory neuron | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.04E-18 | 4.56E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.06E-18 | 4.64E-16 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.06E-18 | 4.64E-16 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.07E-18 | 4.69E-16 |
| Insomnia-Excitatory neuron | Excitatory neuron | Nerve cell | Primary motor cortex | 1.11E-18 | 4.86E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.11E-18 | 4.86E-16 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.13E-18 | 4.95E-16 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.12E-18 | 5.06E-16 |
| Insomnia-Excitatory neuron | Excitatory neuron | Nerve cell | Primary motor cortex | 1.16E-18 | 5.08E-16 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.16E-18 | 5.08E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.24E-18 | 5.43E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.27E-18 | 5.56E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.28E-18 | 5.61E-16 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.28E-18 | 5.61E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.28E-18 | 5.61E-16 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.31E-18 | 5.74E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.27E-18 | 5.74E-16 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.32E-18 | 5.78E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.34E-18 | 5.87E-16 |
| Insomnia-Inhibitory neuron | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.35E-18 | 5.91E-16 |
| Insomnia-Inhibitory neuron | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.35E-18 | 5.91E-16 |
| Insomnia-tALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 1.36E-18 | 5.96E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.44E-18 | 6.31E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.45E-18 | 6.35E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.41E-18 | 6.37E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.47E-18 | 6.44E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.59E-18 | 6.96E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.60E-18 | 7.01E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.63E-18 | 7.14E-16 |
| Insomnia-Inhibitory neuron | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.65E-18 | 7.23E-16 |
| Insomnia-Inhibitory neuron | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.70E-18 | 7.45E-16 |

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|---|-------------------|------------|----------------------|----------|----------|
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.70E-18 | 7.45E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.73E-18 | 7.58E-16 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.76E-18 | 7.71E-16 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.71E-18 | 7.73E-16 |
| Insomnia-Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.77E-18 | 7.75E-16 |
| Insomnia-Insomnia-Insomnia-Mean_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.88E-18 | 8.23E-16 |
| Insomnia-Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.04E-18 | 8.94E-16 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.04E-18 | 8.94E-16 |
| Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.06E-18 | 9.31E-16 |
| Insomnia-Insomnia-Mean_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 2.20E-18 | 9.64E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.23E-18 | 9.77E-16 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.24E-18 | 9.81E-16 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.25E-18 | 9.86E-16 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.29E-18 | 1.00E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.30E-18 | 1.01E-15 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.41E-18 | 1.06E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.46E-18 | 1.08E-15 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.56E-18 | 1.16E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.67E-18 | 1.17E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.69E-18 | 1.18E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.67E-18 | 1.21E-15 |
| Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.77E-18 | 1.21E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.71E-18 | 1.22E-15 |
| Insomnia-Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.92E-18 | 1.28E-15 |
| Insomnia-Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.97E-18 | 1.30E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.99E-18 | 1.31E-15 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.93E-18 | 1.32E-15 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 3.03E-18 | 1.33E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.97E-18 | 1.34E-15 |
| Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.12E-18 | 1.37E-15 |
| Insomnia-Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.12E-18 | 1.37E-15 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.18E-18 | 1.39E-15 |
| Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.26E-18 | 1.43E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.29E-18 | 1.44E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.20E-18 | 1.45E-15 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.37E-18 | 1.48E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.37E-18 | 1.52E-15 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.53E-18 | 1.55E-15 |

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|---------------------|-------------------|------------|----------------------|----------|----------|
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.63E-18 | 1.59E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.60E-18 | 1.63E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.14E-18 | 1.81E-15 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.19E-18 | 1.84E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.20E-18 | 1.84E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.33E-18 | 1.90E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.36E-18 | 1.91E-15 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.38E-18 | 1.92E-15 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.49E-18 | 1.97E-15 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.50E-18 | 1.97E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.52E-18 | 1.98E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.44E-18 | 2.01E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.66E-18 | 2.11E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.84E-18 | 2.12E-15 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.97E-18 | 2.18E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.99E-18 | 2.19E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.01E-18 | 2.19E-15 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 4.89E-18 | 2.21E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.92E-18 | 2.22E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.96E-18 | 2.24E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.11E-18 | 2.31E-15 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.41E-18 | 2.37E-15 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.47E-18 | 2.40E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.41E-18 | 2.45E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.62E-18 | 2.54E-15 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.96E-18 | 2.61E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.97E-18 | 2.61E-15 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.01E-18 | 2.63E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.25E-18 | 2.83E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.60E-18 | 2.89E-15 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.68E-18 | 2.93E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.53E-18 | 2.95E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.53E-18 | 2.95E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 6.56E-18 | 2.97E-15 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.77E-18 | 2.97E-15 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.07E-18 | 3.10E-15 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.18E-18 | 3.14E-15 |

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| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.18E-18 | 3.14E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.01E-18 | 3.51E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.81E-18 | 3.53E-15 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.20E-18 | 3.59E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.40E-18 | 3.68E-15 |
| Insomnia-Mean_ALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 8.42E-18 | 3.69E-15 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.59E-18 | 3.76E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.33E-18 | 3.77E-15 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.06E-18 | 3.97E-15 |
| Insomnia-Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.10E-18 | 3.99E-15 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.45E-18 | 4.14E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.88E-18 | 4.33E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.80E-18 | 4.43E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.97E-18 | 4.51E-15 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.03E-17 | 4.51E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.01E-17 | 4.57E-15 |
| Insomnia-Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.06E-17 | 4.64E-15 |
| Insomnia-Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.08E-17 | 4.73E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.17E-17 | 5.12E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.48E-17 | 6.69E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.63E-17 | 7.14E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.65E-17 | 7.46E-15 |
| Insomnia-Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.75E-17 | 7.67E-15 |
| Insomnia-tALPS | Astrocyte | Nerve cell | Primary motor cortex | 1.76E-17 | 7.71E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.83E-17 | 8.27E-15 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.92E-17 | 8.41E-15 |
| Insomnia-Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.93E-17 | 8.45E-15 |
| Insomnia-Right_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.00E-17 | 8.76E-15 |
| Insomnia-Insomnia-pALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 2.15E-17 | 9.42E-15 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.09E-17 | 9.45E-15 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.16E-17 | 9.46E-15 |
| Insomnia-Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.17E-17 | 9.50E-15 |
| Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.52E-17 | 1.10E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.47E-17 | 1.12E-14 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.57E-17 | 1.13E-14 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.63E-17 | 1.15E-14 |
| Insomnia-Insomnia-Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.70E-17 | 1.18E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.71E-17 | 1.22E-14 |

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| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.90E-17 | 1.27E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.05E-17 | 1.34E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.07E-17 | 1.39E-14 |
| Insomnia-aALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 3.50E-17 | 1.44E-14 |
| Insomnia-mALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 3.33E-17 | 1.46E-14 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 3.61E-17 | 1.58E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.66E-17 | 1.60E-14 |
| Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.66E-17 | 1.60E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.88E-17 | 1.75E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.15E-17 | 1.82E-14 |
| Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.15E-17 | 1.82E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.58E-17 | 2.01E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.80E-17 | 2.10E-14 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.99E-17 | 2.19E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.89E-17 | 2.21E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.90E-17 | 2.21E-14 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 5.09E-17 | 2.23E-14 |
| Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.09E-17 | 2.23E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.38E-17 | 2.36E-14 |
| Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.38E-17 | 2.36E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.80E-17 | 2.54E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 5.85E-17 | 2.56E-14 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.42E-17 | 2.90E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.15E-17 | 3.23E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.14E-17 | 3.57E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.29E-17 | 3.63E-14 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 8.39E-17 | 3.79E-14 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.78E-17 | 4.28E-14 |
| Insomnia-aALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.10E-16 | 4.53E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.06E-16 | 4.64E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.08E-16 | 4.88E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.20E-16 | 5.26E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.29E-16 | 5.65E-14 |
| Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.29E-16 | 5.65E-14 |
| Insomnia-pALPS | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 1.27E-16 | 5.74E-14 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.35E-16 | 6.10E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.44E-16 | 6.31E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.40E-16 | 6.33E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.46E-16 | 6.39E-14 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-16 | 6.75E-14 |
| Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.54E-16 | 6.75E-14 |
| Insomnia-tALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.61E-16 | 7.05E-14 |
| Insomnia-mALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.76E-16 | 7.71E-14 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.74E-16 | 7.86E-14 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.99E-16 | 8.72E-14 |
| Insomnia-tALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.00E-16 | 8.76E-14 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.04E-16 | 8.94E-14 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.15E-16 | 9.42E-14 |

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| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.24E-16 | 1.01E-13 |
| Insomnia-aALPS | Astrocyte | Nerve cell | Primary motor cortex | 2.51E-16 | 1.03E-13 |
| Insomnia-tALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.41E-16 | 1.06E-13 |
| Insomnia-Right_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.55E-16 | 1.12E-13 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.63E-16 | 1.15E-13 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.79E-16 | 1.22E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.72E-16 | 1.23E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.75E-16 | 1.24E-13 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 2.85E-16 | 1.25E-13 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 2.97E-16 | 1.30E-13 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.18E-16 | 1.39E-13 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 3.37E-16 | 1.48E-13 |
| Insomnia-Mean_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 3.38E-16 | 1.48E-13 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 3.48E-16 | 1.52E-13 |
| Insomnia-pALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 3.88E-16 | 1.75E-13 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 4.69E-16 | 2.05E-13 |
| Insomnia-Insomnia- | Oligodendrocyte progenitor cell | Nerve cell | Primary motor cortex | 5.34E-16 | 2.34E-13 |
| Insomnia-mALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 5.48E-16 | 2.40E-13 |
| Insomnia-mALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 6.31E-16 | 2.76E-13 |
| Insomnia-Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 7.71E-16 | 3.38E-13 |
| Insomnia-mALPS | Astrocyte | Nerve cell | Primary motor cortex | 8.59E-16 | 3.76E-13 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 9.10E-16 | 3.99E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.08E-15 | 4.88E-13 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.24E-15 | 5.43E-13 |
| Insomnia-mALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.28E-15 | 5.61E-13 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.31E-15 | 5.74E-13 |
| Insomnia-tALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.36E-15 | 5.96E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.35E-15 | 6.10E-13 |
| Insomnia-Mean_ALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 1.53E-15 | 6.70E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.55E-15 | 7.01E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.55E-15 | 7.01E-13 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.59E-15 | 7.19E-13 |
| Insomnia-Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.80E-15 | 7.88E-13 |
| Insomnia-Right_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 1.81E-15 | 7.93E-13 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.82E-15 | 7.97E-13 |
| Insomnia-Mean_ALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 1.87E-15 | 8.19E-13 |
| Insomnia-Mean_ALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 2.39E-15 | 1.05E-12 |
| Insomnia-Mean_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 3.04E-15 | 1.33E-12 |

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|-------------------------|------------------------------|------------------|----------------------|----------|----------|
| Insomnia-pALPS | Oligodendrocyte | Nerve cell | Primary motor cortex | 3.19E-15 | 1.44E-12 |
| Insomnia- | Inhibitory neuron | Nerve cell | Primary motor cortex | 4.13E-15 | 1.81E-12 |
| Insomnia- | Oligodendrocyte | Nerve cell | Primary motor cortex | 5.31E-15 | 2.33E-12 |
| Insomnia- Right_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 5.32E-15 | 2.33E-12 |
| Insomnia-pALPS | Excitatory neuron | Nerve cell | Primary motor cortex | 6.64E-15 | 3.00E-12 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.00E-15 | 3.16E-12 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 7.79E-15 | 3.52E-12 |
| Insomnia-pALPS | Inhibitory neuron | Nerve cell | Primary motor cortex | 8.08E-15 | 3.65E-12 |
| Insomnia- | Excitatory neuron | Nerve cell | Primary motor cortex | 8.84E-15 | 3.87E-12 |
| Insomnia-pALPS | Astrocyte | Nerve cell | Primary motor cortex | 1.32E-14 | 5.97E-12 |
| Insomnia- | Astrocyte | Nerve cell | Primary motor cortex | 1.38E-14 | 6.04E-12 |
| Insomnia- | Oligodendrocyte | Nerve cell | Primary motor cortex | 1.51E-14 | 6.61E-12 |
| Insomnia-aALPS | Microglia | Nerve cell | Primary motor cortex | 2.59E-14 | 1.07E-11 |
| Insomnia-aALPS | Astrocyte | Nerve cell | Primary motor cortex | 5.54E-14 | 2.28E-11 |
| Insomnia-mALPS | Astrocyte | Nerve cell | Primary motor cortex | 5.52E-14 | 2.42E-11 |
| Insomnia-tALPS | Astrocyte | Nerve cell | Primary motor cortex | 6.21E-14 | 2.72E-11 |
| Insomnia- Right_ALPS | Microglia | Nerve cell | Primary motor cortex | 4.94E-13 | 2.16E-10 |
| Insomnia-mALPS | Microglia | Nerve cell | Primary motor cortex | 4.31E-12 | 1.89E-09 |
| Insomnia-tALPS | Astrocyte | Nerve cell | Primary motor cortex | 5.30E-12 | 2.32E-09 |
| Insomnia-pALPS | Astrocyte | Nerve cell | Primary motor cortex | 6.07E-12 | 2.74E-09 |
| Insomnia- Mean_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 7.11E-12 | 3.11E-09 |
| Insomnia- Right_ALPS | Endothelial cell | Endothelial cell | Primary motor cortex | 1.21E-11 | 5.30E-09 |
| Insomnia-aALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 1.69E-11 | 6.96E-09 |
| Insomnia- | Astrocyte | Nerve cell | Primary motor cortex | 1.09E-10 | 4.77E-08 |
| Insomnia-tALPS | Microglia | Nerve cell | Primary motor cortex | 1.10E-10 | 4.82E-08 |
| Insomnia-pALPS | Microglia | Nerve cell | Primary motor cortex | 1.94E-10 | 8.77E-08 |
| Insomnia- Right_ALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 2.66E-10 | 1.17E-07 |
| Insomnia-pALPS | Astrocyte | Nerve cell | Primary motor cortex | 2.76E-10 | 1.25E-07 |
| Insomnia-mALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 3.06E-10 | 1.34E-07 |
| Insomnia- Right_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 3.18E-10 | 1.39E-07 |
| Insomnia- Mean_ALPS | Endothelial cell | Endothelial cell | Primary motor cortex | 3.41E-10 | 1.49E-07 |
| Insomnia- Mean_ALPS | Microglia | Nerve cell | Primary motor cortex | 3.48E-10 | 1.52E-07 |
| Insomnia-tALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 4.27E-10 | 1.87E-07 |
| Insomnia-mALPS | Astrocyte | Nerve cell | Primary motor cortex | 5.19E-10 | 2.27E-07 |
| Insomnia- | Microglia | Nerve cell | Primary motor cortex | 1.76E-09 | 7.71E-07 |
| Insomnia- Mean_ALPS | Astrocyte | Nerve cell | Primary motor cortex | 4.80E-09 | 2.10E-06 |
| Insomnia- Mean_ALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 5.33E-09 | 2.33E-06 |
| Insomnia-pALPS | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 6.27E-09 | 2.83E-06 |
| Insomnia-aALPS | Endothelial cell | Endothelial | Primary motor cortex | 1.16E-08 | 4.78E-06 |

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|-------------------------|---------------------------------|-------------|---------------------------|----------|----------|
| Insomnia- | Vascular leptomeningeal cell | Nerve cell | Primary motor cortex | 2.14E-08 | 9.37E-06 |
| Insomnia- | Astrocyte | Nerve cell | Primary motor cortex | 2.64E-08 | 1.16E-05 |
| Insomnia-mALPS | Endothelial cell | Endothelial | Primary motor cortex | 3.25E-08 | 1.42E-05 |
| Insomnia-pALPS | Endothelial cell | Endothelial | Primary motor cortex | 4.54E-08 | 2.05E-05 |
| Insomnia-tALPS | Endothelial cell | Endothelial | Primary motor cortex | 8.15E-08 | 3.57E-05 |
| Insomnia- | Endothelial cell | Endothelial | Primary motor cortex | 4.05E-07 | 1.77E-04 |
| Insomnia-pALPS | Neuron | Nerve cell | Cortical organoids | 9.84E-07 | 4.45E-04 |
| Insomnia-aALPS | Neuron | Nerve cell | Cortical organoids | 1.09E-06 | 4.49E-04 |
| Insomnia- Right_ALPS | Neuron | Nerve cell | Brain | 1.22E-06 | 5.34E-04 |
| Insomnia-mALPS | Neuron | Nerve cell | Cortical organoids | 1.76E-06 | 7.71E-04 |
| Insomnia- | Neuron | Nerve cell | Substantia nigra | 2.45E-06 | 1.07E-03 |
| Insomnia-aALPS | Neuron | Nerve cell | Substantia nigra | 2.91E-06 | 1.20E-03 |
| Insomnia-mALPS | Neuron | Nerve cell | Substantia nigra | 5.58E-06 | 2.44E-03 |
| Insomnia-pALPS | Neuron | Nerve cell | Brain | 5.88E-06 | 2.66E-03 |
| Insomnia-aALPS | Neuron | Nerve cell | Substantia nigra | 9.80E-06 | 4.04E-03 |
| Insomnia-tALPS | Neuron | Nerve cell | Brain | 9.40E-06 | 4.12E-03 |
| Insomnia-mALPS | Neuron | Nerve cell | Brain | 9.90E-06 | 4.34E-03 |
| Insomnia-tALPS | Neuron | Nerve cell | Cortical organoids | 1.08E-05 | 4.73E-03 |
| Insomnia- Mean_ALPS | Neuron | Nerve cell | Substantia nigra | 1.26E-05 | 5.52E-03 |
| Insomnia- Right_ALPS | Neuron | Nerve cell | Brain | 1.39E-05 | 6.09E-03 |
| Insomnia- Right_ALPS | Oligodendrocyte | Nerve cell | Cerebellum | 1.40E-05 | 6.13E-03 |
| Insomnia- Mean_ALPS | Retinal ganglion cell | Nerve cell | Human embryo forebrain | 1.56E-05 | 6.83E-03 |
| Insomnia-tALPS | Neuron | Nerve cell | Substantia nigra | 1.94E-05 | 8.50E-03 |
| Insomnia- Right_ALPS | Oligodendrocyte progenitor cell | Nerve cell | Substantia nigra | 2.06E-05 | 9.02E-03 |
| Insomnia-tALPS | Neuron | Nerve cell | Brain | 2.41E-05 | 1.06E-02 |
| Insomnia- | Oligodendrocyte | Nerve cell | Cerebellum | 2.92E-05 | 1.28E-02 |
| Insomnia-pALPS | Neuron | Nerve cell | Human embryo | 2.83E-05 | 1.28E-02 |
| Insomnia-mALPS | Neuron | Nerve cell | Brain | 2.97E-05 | 1.30E-02 |
| Insomnia- Mean_ALPS | Neuron | Nerve cell | Human embryo forebrain | 2.97E-05 | 1.30E-02 |
| Insomnia-pALPS | Neuron | Nerve cell | Substantia nigra | 3.10E-05 | 1.40E-02 |
| Insomnia-pALPS | Neuron | Nerve cell | Brain | 3.33E-05 | 1.51E-02 |
| Insomnia- Mean_ALPS | Neuron | Nerve cell | Brain | 4.50E-05 | 1.97E-02 |
| Insomnia-aALPS | Neuron | Nerve cell | Brain | 5.18E-05 | 2.13E-02 |
| Insomnia- Mean_ALPS | Oligodendrocyte | Nerve cell | Cerebellum | 5.06E-05 | 2.22E-02 |
| Insomnia-aALPS | Neuron | Nerve cell | Human embryo | 5.54E-05 | 2.28E-02 |
| Insomnia-pALPS | Neuron | Nerve cell | Brain | 5.28E-05 | 2.39E-02 |
| Insomnia-pALPS | Neuron | Nerve cell | Brain | 5.67E-05 | 2.56E-02 |
| Insomnia-tALPS | Neuron | Nerve cell | Brain | 6.05E-05 | 2.65E-02 |
| Insomnia- Mean_ALPS | Oligodendrocyte progenitor cell | Nerve cell | Substantia nigra | 6.53E-05 | 2.86E-02 |

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|-------------------------|---------------------------------|------------|------------------|----------|----------|
| Insomnia- Right_ALPS | Neuron | Nerve cell | Brain | 8.10E-05 | 3.55E-02 |
| Insomnia-aALPS | Retinal ganglion cell | Nerve cell | Human embryo | 8.85E-05 | 3.65E-02 |
| Insomnia-mALPS | Neuron | Nerve cell | Human embryo | 8.35E-05 | 3.66E-02 |
| Insomnia-mALPS | Neuron | Nerve cell | Substantia nigra | 8.94E-05 | 3.92E-02 |
| Insomnia-pALPS | Retinal ganglion cell | Nerve cell | Human embryo | 8.73E-05 | 3.95E-02 |
| Insomnia-aALPS | Neuron | Nerve cell | Brain | 9.98E-05 | 4.11E-02 |
| Insomnia-mALPS | Neuron | Nerve cell | Brain | 9.46E-05 | 4.14E-02 |
| Insomnia-aALPS | Oligodendrocyte progenitor cell | Nerve cell | Substantia nigra | 1.17E-04 | 4.82E-02 |
| Insomnia-mALPS | Neuron | Nerve cell | Brain | 1.13E-04 | 4.95E-02 |
| Insomnia-tALPS | Neuron | Nerve cell | Substantia nigra | 1.13E-04 | 4.95E-02 |

Supplementary Table 18. Tissue-specific genetic enrichment analysis for shared genetic mechanisms between insomnia and ALPS subtypes using the GSMAP method, based on single-cell RNA sequencing data from a mouse model at embryonic day 16.5 (E16.5_E1S1.MOSTA.h5ad). The table highlights significant enrichments in various tissues, with the strongest signals observed in the spinal cord ($p_{\text{cauchy}} = 6.30 \times 10^{-13}$) and brain ($p_{\text{cauchy}} = 5.17 \times 10^{-12}$). This suggests that the shared genetic basis of insomnia and ALPS function is established early in development within key neural and cerebrospinal fluid-related tissues.

| Trait | Tissue/Cell Type | p_{cauchy} | p_{median} |
|--------------------|----------------------|---------------------|---------------------|
| Insomnia-aALPS | Spinal cord | 6.30E-13 | 1.63E-07 |
| Insomnia-aALPS | Brain | 5.17E-12 | 3.22E-08 |
| Insomnia-aALPS | Sympathetic nerve | 2.48E-08 | 2.64E-06 |
| Insomnia-aALPS | Meninges | 1.14E-06 | 1.27E-03 |
| Insomnia-aALPS | Choroid plexus | 1.18E-06 | 2.26E-04 |
| Insomnia-aALPS | Muscle | 1.32E-06 | 2.86E-04 |
| Insomnia-aALPS | Mucosal epithelium | 8.42E-06 | 2.01E-03 |
| Insomnia-aALPS | Dorsal root ganglion | 1.86E-05 | 3.43E-04 |
| Insomnia-aALPS | Inner ear | 2.09E-05 | 1.39E-03 |
| Insomnia-aALPS | Lung | 2.41E-05 | 8.31E-04 |
| Insomnia-aALPS | Jaw and tooth | 3.09E-05 | 3.67E-03 |
| Insomnia-aALPS | Cartilage primordium | 4.95E-05 | 2.62E-03 |
| Insomnia-aALPS | Kidney | 6.73E-05 | 4.31E-03 |
| Insomnia-aALPS | Connective tissue | 1.00E-04 | 1.23E-02 |
| Insomnia-aALPS | GI tract | 1.79E-04 | 1.65E-02 |
| Insomnia-aALPS | Adrenal gland | 7.89E-04 | 3.68E-03 |
| Insomnia-aALPS | Cavity | 8.81E-04 | 1.14E-01 |
| Insomnia-aALPS | Smooth muscle | 9.37E-04 | 2.28E-02 |
| Insomnia-aALPS | Cartilage | 1.02E-03 | 2.84E-02 |
| Insomnia-aALPS | Adipose tissue | 1.10E-03 | 3.02E-02 |
| Insomnia-aALPS | Submandibular gland | 1.22E-03 | 2.13E-02 |
| Insomnia-aALPS | Heart | 5.61E-03 | 4.50E-02 |
| Insomnia-aALPS | Liver | 4.92E-02 | 1.73E-01 |
| Insomnia-aALPS | Epidermis | 7.03E-02 | 2.33E-01 |
| Insomnia-aALPS | Bone | 1.31E-01 | 2.97E-01 |
| Insomnia-Left_ALPS | Brain | 2.74E-11 | 9.25E-08 |
| Insomnia-Left_ALPS | Spinal cord | 3.31E-11 | 4.53E-07 |
| Insomnia-Left_ALPS | Sympathetic nerve | 4.95E-08 | 3.56E-06 |
| Insomnia-Left_ALPS | Meninges | 6.78E-07 | 9.09E-04 |
| Insomnia-Left_ALPS | Muscle | 2.19E-06 | 4.78E-04 |
| Insomnia-Left_ALPS | Choroid plexus | 2.32E-06 | 1.40E-04 |
| Insomnia-Left_ALPS | Mucosal epithelium | 1.20E-05 | 1.71E-03 |
| Insomnia-Left_ALPS | Lung | 1.23E-05 | 4.26E-04 |
| Insomnia-Left_ALPS | Inner ear | 1.96E-05 | 1.86E-03 |
| Insomnia-Left_ALPS | Jaw and tooth | 3.23E-05 | 3.92E-03 |
| Insomnia-Left_ALPS | Dorsal root ganglion | 3.74E-05 | 5.53E-04 |
| Insomnia-Left_ALPS | Kidney | 4.11E-05 | 3.17E-03 |
| Insomnia-Left_ALPS | Connective tissue | 5.19E-05 | 1.13E-02 |

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| Insomnia-Left_ALPS | Cartilage primordium | 7.86E-05 | 3.13E-03 |
| Insomnia-Left_ALPS | GI tract | 1.60E-04 | 1.42E-02 |
| Insomnia-Left_ALPS | Adrenal gland | 1.78E-04 | 1.88E-03 |
| Insomnia-Left_ALPS | Cavity | 6.10E-04 | 1.14E-01 |
| Insomnia-Left_ALPS | Cartilage | 1.19E-03 | 2.79E-02 |
| Insomnia-Left_ALPS | Submandibular gland | 1.45E-03 | 1.81E-02 |
| Insomnia-Left_ALPS | Smooth muscle | 1.65E-03 | 2.49E-02 |
| Insomnia-Left_ALPS | Adipose tissue | 1.82E-03 | 3.50E-02 |
| Insomnia-Left_ALPS | Heart | 6.08E-03 | 4.82E-02 |
| Insomnia-Left_ALPS | Liver | 4.76E-02 | 1.78E-01 |
| Insomnia-Left_ALPS | Epidermis | 5.07E-02 | 2.15E-01 |
| Insomnia-Left_ALPS | Bone | 1.63E-01 | 3.15E-01 |
| Insomnia-mALPS | Spinal cord | 4.92E-13 | 1.21E-07 |
| Insomnia-mALPS | Brain | 2.17E-12 | 2.05E-08 |
| Insomnia-mALPS | Sympathetic nerve | 6.13E-09 | 1.55E-06 |
| Insomnia-mALPS | Choroid plexus | 7.07E-07 | 1.64E-04 |
| Insomnia-mALPS | Meninges | 1.11E-06 | 1.44E-03 |
| Insomnia-mALPS | Muscle | 1.11E-06 | 2.98E-04 |
| Insomnia-mALPS | Mucosal epithelium | 4.44E-06 | 1.77E-03 |
| Insomnia-mALPS | Dorsal root ganglion | 1.37E-05 | 2.78E-04 |
| Insomnia-mALPS | Inner ear | 1.65E-05 | 8.38E-04 |
| Insomnia-mALPS | Lung | 1.92E-05 | 6.96E-04 |
| Insomnia-mALPS | Jaw and tooth | 2.36E-05 | 2.98E-03 |
| Insomnia-mALPS | Cartilage primordium | 3.07E-05 | 2.06E-03 |
| Insomnia-mALPS | Kidney | 4.55E-05 | 4.13E-03 |
| Insomnia-mALPS | Connective tissue | 8.18E-05 | 1.15E-02 |
| Insomnia-mALPS | GI tract | 1.84E-04 | 1.82E-02 |
| Insomnia-mALPS | Cartilage | 5.63E-04 | 2.47E-02 |
| Insomnia-mALPS | Adrenal gland | 7.40E-04 | 4.47E-03 |
| Insomnia-mALPS | Cavity | 9.07E-04 | 1.18E-01 |
| Insomnia-mALPS | Adipose tissue | 9.59E-04 | 3.18E-02 |
| Insomnia-mALPS | Submandibular gland | 1.46E-03 | 2.32E-02 |
| Insomnia-mALPS | Smooth muscle | 2.21E-03 | 3.23E-02 |
| Insomnia-mALPS | Heart | 9.40E-03 | 5.64E-02 |
| Insomnia-mALPS | Liver | 7.67E-02 | 2.15E-01 |
| Insomnia-mALPS | Epidermis | 9.48E-02 | 2.68E-01 |
| Insomnia-mALPS | Bone | 1.85E-01 | 3.23E-01 |
| Insomnia-Mean_ALPS | Spinal cord | 2.91E-11 | 5.98E-07 |
| Insomnia-Mean_ALPS | Brain | 3.40E-11 | 1.08E-07 |
| Insomnia-Mean_ALPS | Sympathetic nerve | 5.21E-08 | 3.94E-06 |
| Insomnia-Mean_ALPS | Meninges | 6.83E-07 | 9.17E-04 |
| Insomnia-Mean_ALPS | Choroid plexus | 1.39E-06 | 1.41E-04 |
| Insomnia-Mean_ALPS | Muscle | 1.73E-06 | 4.20E-04 |
| Insomnia-Mean_ALPS | Mucosal epithelium | 7.74E-06 | 1.48E-03 |
| Insomnia-Mean_ALPS | Lung | 8.66E-06 | 3.46E-04 |
| Insomnia-Mean_ALPS | Inner ear | 2.35E-05 | 1.79E-03 |
| Insomnia-Mean_ALPS | Kidney | 2.58E-05 | 2.45E-03 |

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| Insomnia-Mean_ALPS | Jaw and tooth | 2.86E-05 | 4.01E-03 |
| Insomnia-Mean_ALPS | Connective tissue | 3.91E-05 | 1.02E-02 |
| Insomnia-Mean_ALPS | Dorsal root ganglion | 4.73E-05 | 6.30E-04 |
| Insomnia-Mean_ALPS | Cartilage primordium | 6.62E-05 | 2.85E-03 |
| Insomnia-Mean_ALPS | GI tract | 1.14E-04 | 1.15E-02 |
| Insomnia-Mean_ALPS | Adrenal gland | 1.50E-04 | 1.51E-03 |
| Insomnia-Mean_ALPS | Cavity | 5.70E-04 | 1.15E-01 |
| Insomnia-Mean_ALPS | Cartilage | 9.85E-04 | 2.65E-02 |
| Insomnia-Mean_ALPS | Smooth muscle | 1.32E-03 | 2.65E-02 |
| Insomnia-Mean_ALPS | Adipose tissue | 1.54E-03 | 3.46E-02 |
| Insomnia-Mean_ALPS | Submandibular gland | 1.56E-03 | 1.90E-02 |
| Insomnia-Mean_ALPS | Heart | 7.52E-03 | 5.46E-02 |
| Insomnia-Mean_ALPS | Liver | 4.04E-02 | 1.62E-01 |
| Insomnia-Mean_ALPS | Epidermis | 5.57E-02 | 2.26E-01 |
| Insomnia-Mean_ALPS | Bone | 1.69E-01 | 3.15E-01 |
| Insomnia-pALPS | Spinal cord | 5.51E-13 | 1.25E-07 |
| Insomnia-pALPS | Brain | 1.79E-12 | 1.91E-08 |
| Insomnia-pALPS | Sympathetic nerve | 3.42E-09 | 1.36E-06 |
| Insomnia-pALPS | Choroid plexus | 7.92E-07 | 1.38E-04 |
| Insomnia-pALPS | Meninges | 1.67E-06 | 1.68E-03 |
| Insomnia-pALPS | Muscle | 2.07E-06 | 3.58E-04 |
| Insomnia-pALPS | Mucosal epithelium | 4.45E-06 | 2.08E-03 |
| Insomnia-pALPS | Dorsal root ganglion | 1.22E-05 | 2.74E-04 |
| Insomnia-pALPS | Inner ear | 1.99E-05 | 1.06E-03 |
| Insomnia-pALPS | Lung | 2.37E-05 | 6.51E-04 |
| Insomnia-pALPS | Jaw and tooth | 3.34E-05 | 3.38E-03 |
| Insomnia-pALPS | Cartilage primordium | 4.29E-05 | 2.33E-03 |
| Insomnia-pALPS | Kidney | 4.44E-05 | 4.36E-03 |
| Insomnia-pALPS | Connective tissue | 1.11E-04 | 1.34E-02 |
| Insomnia-pALPS | GI tract | 2.77E-04 | 1.69E-02 |
| Insomnia-pALPS | Adrenal gland | 4.60E-04 | 4.79E-03 |
| Insomnia-pALPS | Cartilage | 6.59E-04 | 2.54E-02 |
| Insomnia-pALPS | Cavity | 1.06E-03 | 1.21E-01 |
| Insomnia-pALPS | Adipose tissue | 1.35E-03 | 3.68E-02 |
| Insomnia-pALPS | Submandibular gland | 1.49E-03 | 2.61E-02 |
| Insomnia-pALPS | Smooth muscle | 3.18E-03 | 3.77E-02 |
| Insomnia-pALPS | Heart | 9.47E-03 | 5.92E-02 |
| Insomnia-pALPS | Bone | 6.72E-02 | 3.14E-01 |
| Insomnia-pALPS | Liver | 7.64E-02 | 2.18E-01 |
| Insomnia-pALPS | Epidermis | 1.02E-01 | 2.77E-01 |
| Insomnia-Right_ALPS | Spinal cord | 2.31E-11 | 6.66E-07 |
| Insomnia-Right_ALPS | Brain | 3.26E-11 | 1.15E-07 |
| Insomnia-Right_ALPS | Sympathetic nerve | 5.06E-08 | 4.41E-06 |
| Insomnia-Right_ALPS | Meninges | 8.07E-07 | 1.08E-03 |
| Insomnia-Right_ALPS | Choroid plexus | 2.05E-06 | 1.64E-04 |
| Insomnia-Right_ALPS | Muscle | 2.16E-06 | 4.49E-04 |
| Insomnia-Right_ALPS | Mucosal epithelium | 8.57E-06 | 1.53E-03 |

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|---------------------|----------------------|----------|----------|
| Insomnia-Right_ALPS | Lung | 8.81E-06 | 3.54E-04 |
| Insomnia-Right_ALPS | Kidney | 2.20E-05 | 2.14E-03 |
| Insomnia-Right_ALPS | Inner ear | 3.28E-05 | 1.76E-03 |
| Insomnia-Right_ALPS | Jaw and tooth | 3.39E-05 | 4.10E-03 |
| Insomnia-Right_ALPS | Connective tissue | 3.98E-05 | 1.01E-02 |
| Insomnia-Right_ALPS | Dorsal root ganglion | 6.19E-05 | 7.43E-04 |
| Insomnia-Right_ALPS | Cartilage primordium | 6.44E-05 | 2.78E-03 |
| Insomnia-Right_ALPS | GI tract | 1.24E-04 | 1.06E-02 |
| Insomnia-Right_ALPS | Adrenal gland | 1.56E-04 | 1.62E-03 |
| Insomnia-Right_ALPS | Cavity | 6.15E-04 | 1.18E-01 |
| Insomnia-Right_ALPS | Cartilage | 9.36E-04 | 2.72E-02 |
| Insomnia-Right_ALPS | Smooth muscle | 1.33E-03 | 2.84E-02 |
| Insomnia-Right_ALPS | Adipose tissue | 1.70E-03 | 3.52E-02 |
| Insomnia-Right_ALPS | Submandibular gland | 2.08E-03 | 2.23E-02 |
| Insomnia-Right_ALPS | Heart | 9.83E-03 | 6.04E-02 |
| Insomnia-Right_ALPS | Liver | 3.62E-02 | 1.52E-01 |
| Insomnia-Right_ALPS | Epidermis | 6.58E-02 | 2.41E-01 |
| Insomnia-Right_ALPS | Bone | 7.76E-02 | 3.16E-01 |
| Insomnia-tALPS | Spinal cord | 5.27E-13 | 1.42E-07 |
| Insomnia-tALPS | Brain | 2.89E-12 | 2.41E-08 |
| Insomnia-tALPS | Sympathetic nerve | 7.01E-09 | 1.61E-06 |
| Insomnia-tALPS | Choroid plexus | 8.11E-07 | 1.64E-04 |
| Insomnia-tALPS | Muscle | 1.16E-06 | 2.82E-04 |
| Insomnia-tALPS | Meninges | 1.39E-06 | 1.38E-03 |
| Insomnia-tALPS | Mucosal epithelium | 4.60E-06 | 1.79E-03 |
| Insomnia-tALPS | Dorsal root ganglion | 1.33E-05 | 2.97E-04 |
| Insomnia-tALPS | Inner ear | 1.74E-05 | 9.84E-04 |
| Insomnia-tALPS | Lung | 1.92E-05 | 6.62E-04 |
| Insomnia-tALPS | Jaw and tooth | 2.72E-05 | 3.09E-03 |
| Insomnia-tALPS | Cartilage primordium | 3.63E-05 | 2.16E-03 |
| Insomnia-tALPS | Kidney | 4.49E-05 | 4.05E-03 |
| Insomnia-tALPS | Connective tissue | 8.70E-05 | 1.16E-02 |
| Insomnia-tALPS | GI tract | 1.84E-04 | 1.64E-02 |
| Insomnia-tALPS | Cartilage | 5.75E-04 | 2.45E-02 |
| Insomnia-tALPS | Adrenal gland | 7.73E-04 | 4.06E-03 |
| Insomnia-tALPS | Cavity | 8.50E-04 | 1.15E-01 |
| Insomnia-tALPS | Adipose tissue | 1.09E-03 | 3.22E-02 |
| Insomnia-tALPS | Submandibular gland | 1.41E-03 | 2.25E-02 |
| Insomnia-tALPS | Smooth muscle | 1.78E-03 | 2.83E-02 |
| Insomnia-tALPS | Heart | 8.55E-03 | 5.25E-02 |
| Insomnia-tALPS | Liver | 6.26E-02 | 1.96E-01 |
| Insomnia-tALPS | Epidermis | 8.54E-02 | 2.59E-01 |
| Insomnia-tALPS | Bone | 1.44E-01 | 3.09E-01 |

Supplementary Table 19. Gene-set enrichment analysis for key genes in specific brain cell types and pathology regions using the GSMAP method. The table highlights significant enrichments for AQP4, MAPT, and HEXIM1, which are implicated in glymphatic system (GS) function.

ex: Excitatory neurons
in: Inhibitory neurons
ast: Astrocytes
oli: Oligodendrocytes
opc: Oligodendrocyte precursor cells
mic: Microglia
Median_GSS: Median Gene Set Score
PCC: Pearson Correlation Coefficient
Ab: Amyloid- β pathology regions
pTau: Phosphorylated tau pathology regions
both: Co-occurring Ab and pTau pathology regions
n_Ab/n_pTau/n_both: Regions next to corresponding pathology areas
none: Non-pathology control regions

| Trait | Gene Symbol | Cell Type | Median_GS S | PCC | Tissue | Median_GS S | PCC |
|-----------|-------------|-----------|-------------|--------|--------|-------------|--------|
| aALPS | AQP4 | ast | 2.557 | -0.049 | n_both | 1.874 | -0.014 |
| aALPS | FMNL1 | mic | 1.745 | 0.009 | both | 1.729 | 0.026 |
| aALPS | EFTUD | ex | 1.731 | -0.004 | none | 0.000 | 0.018 |
| aALPS | PLCD3 | oli | 1.802 | -0.014 | none | 0.000 | 0.000 |
| aALPS | MAPT | ex | 1.942 | 0.027 | both | 1.841 | -0.003 |
| aALPS | DCAKD | oli | 1.756 | -0.022 | none | 0.000 | -0.004 |
| aALPS | HEXIM | ex | 1.739 | -0.002 | Ab | 1.739 | -0.005 |
| aALPS | NMT1 | ex | 1.774 | 0.002 | Ab | 1.783 | -0.011 |
| aALPS | ACBD4 | ast | 0.000 | -0.009 | none | 0.000 | -0.012 |
| AD | AQP4 | ast | 2.553 | -0.015 | n_both | 1.874 | 0.005 |
| AD | NMT1 | ex | 1.774 | 0.006 | none | 0.000 | -0.009 |
| AD | PLCD3 | oli | 1.799 | 0.003 | none | 0.000 | 0.016 |
| AD | ACBD4 | ast | 0.000 | 0.000 | none | 0.000 | 0.008 |
| AD | HEXIM | ex | 1.737 | -0.001 | Ab | 1.738 | 0.006 |
| AD | MAPT | ex | 1.942 | -0.009 | none | 0.000 | -0.013 |
| AD | EFTUD | ex | 1.729 | -0.010 | Ab | 1.783 | -0.002 |
| AD | FMNL1 | mic | 1.745 | -0.017 | n_pTau | 1.729 | -0.009 |
| AD | DCAKD | oli | 1.756 | -0.025 | both | 1.841 | 0.008 |
| Insomnia | AQP4 | ast | 2.553 | 0.087 | n_both | 1.874 | 0.042 |
| Insomnia | PLCD3 | oli | 1.799 | 0.047 | none | 0.000 | 0.022 |
| Insomnia | DCAKD | oli | 1.756 | 0.008 | none | 0.000 | -0.004 |
| Insomnia | EFTUD | ex | 1.729 | 0.001 | none | 0.000 | -0.042 |
| Insomnia | ACBD4 | ast | 0.000 | -0.012 | Ab | 1.770 | -0.006 |
| Insomnia | HEXIM | ex | 1.739 | -0.019 | both | 1.841 | -0.022 |
| Insomnia | FMNL1 | mic | 1.745 | -0.037 | Ab | 1.742 | -0.041 |
| Insomnia | NMT1 | ex | 1.774 | -0.040 | none | 1.727 | -0.011 |
| Insomnia | MAPT | ex | 1.942 | -0.070 | none | 0.000 | -0.011 |
| Left_ALPS | AQP4 | ast | 2.557 | 0.024 | n_both | 1.874 | 0.004 |

| | | | | | | | |
|---------------|------------|-----|-------|--------|--------|-------|--------|
| Left_ALPS | PLCD3 | oli | 1.800 | 0.006 | none | 0.000 | -0.011 |
| Left_ALPS | DCAKD | oli | 1.756 | 0.003 | none | 0.000 | 0.000 |
| Left_ALPS | HEXIM | ex | 1.739 | -0.004 | Ab | 1.783 | -0.017 |
| Left_ALPS | EFTUD | ex | 1.731 | -0.005 | none | 0.000 | -0.004 |
| Left_ALPS | ACBD4 | ast | 0.000 | -0.016 | both | 1.841 | 0.008 |
| Left_ALPS | NMT1 | ex | 1.774 | -0.021 | none | 0.000 | -0.002 |
| Left_ALPS | FMNL1 | mic | 1.745 | -0.028 | both | 1.729 | -0.012 |
| Left_ALPS | MAPT | ex | 1.942 | -0.043 | Ab | 1.739 | -0.010 |
| mALPS | AQP4 | ast | 2.557 | 0.024 | n_both | 1.874 | 0.008 |
| mALPS | PLCD3 | oli | 1.802 | 0.014 | none | 0.000 | 0.004 |
| mALPS | DCAKD | oli | 1.756 | 0.011 | both | 1.729 | -0.014 |
| mALPS | FMNL1 | mic | 1.745 | 0.006 | none | 0.000 | 0.004 |
| mALPS | EFTUD | ex | 1.731 | 0.002 | none | 0.000 | 0.000 |
| mALPS | ACBD4 | ast | 0.000 | -0.012 | Ab | 1.739 | -0.001 |
| mALPS | NMT1 | ex | 1.774 | -0.021 | none | 0.000 | -0.015 |
| mALPS | MAPT | ex | 1.942 | -0.027 | Ab | 1.783 | -0.018 |
| mALPS | HEXIM | ex | 1.739 | -0.035 | both | 1.841 | -0.013 |
| Mean_ALP S | AQP4 | ast | 2.557 | 0.017 | n_both | 1.874 | 0.007 |
| Mean_ALP S | PLCD3 | oli | 1.800 | 0.012 | none | 0.000 | -0.011 |
| Mean_ALP S | DCAKD | oli | 1.756 | 0.010 | none | 0.000 | 0.004 |
| Mean_ALP S | HEXIM 1 | ex | 1.739 | -0.002 | Ab | 1.783 | -0.006 |
| Mean_ALP S | EFTUD 2 | ex | 1.731 | -0.008 | Ab | 1.739 | -0.009 |
| Mean_ALP S | NMT1 | ex | 1.774 | -0.011 | none | 0.000 | 0.000 |
| Mean_ALP S | ACBD4 | ast | 0.000 | -0.016 | none | 0.000 | 0.001 |
| Mean_ALP S | FMNL1 | mic | 1.745 | -0.024 | both | 1.841 | -0.016 |
| Mean_ALP S | MAPT | ex | 1.942 | -0.040 | both | 1.729 | -0.014 |
| pALPS | AQP4 | ast | 2.557 | 0.017 | n_both | 1.874 | 0.023 |
| pALPS | DCAKD | oli | 1.756 | 0.026 | none | 0.000 | -0.016 |
| pALPS | PLCD3 | oli | 1.802 | 0.009 | none | 0.000 | 0.024 |
| pALPS | FMNL1 | mic | 1.745 | 0.008 | Ab | 1.739 | -0.010 |
| pALPS | ACBD4 | ast | 0.000 | 0.000 | Ab | 1.783 | 0.010 |
| pALPS | EFTUD | ex | 1.731 | -0.008 | both | 1.729 | -0.013 |
| pALPS | HEXIM | ex | 1.739 | -0.016 | none | 0.000 | 0.005 |
| pALPS | NMT1 | ex | 1.774 | -0.019 | none | 0.000 | -0.004 |
| pALPS | MAPT | ex | 1.942 | -0.044 | both | 1.841 | -0.027 |
| Right_ALP | AQP4 | ast | 2.557 | 0.016 | n_both | 1.874 | 0.011 |
| Right_ALP | EFTUD | ex | 1.731 | 0.003 | none | 0.000 | -0.015 |
| Right_ALP | NMT1 | ex | 1.774 | -0.004 | none | 0.000 | -0.014 |
| Right_ALP | DCAKD | oli | 1.756 | -0.008 | none | 0.000 | -0.011 |
| Right_ALP | PLCD3 | oli | 1.800 | -0.009 | Ab | 1.739 | 0.006 |

| | | | | | | | |
|-----------|-------|-----|-------|--------|--------|-------|--------|
| Right_ALP | FMNL1 | mic | 1.745 | -0.009 | Ab | 1.783 | -0.017 |
| Right_ALP | HEXIM | ex | 1.739 | -0.011 | none | 0.000 | -0.012 |
| Right_ALP | ACBD4 | ast | 0.000 | -0.011 | both | 1.729 | -0.008 |
| Right_ALP | MAPT | ex | 1.942 | -0.012 | both | 1.841 | -0.043 |
| tALPS | AQP4 | ast | 2.557 | 0.029 | n_both | 1.874 | 0.014 |
| tALPS | PLCD3 | oli | 1.802 | 0.025 | none | 0.000 | 0.017 |
| tALPS | DCAKD | oli | 1.756 | 0.005 | Ab | 1.739 | -0.025 |
| tALPS | FMNL1 | mic | 1.745 | -0.002 | both | 1.729 | -0.004 |
| tALPS | EFTUD | ex | 1.731 | -0.004 | none | 0.000 | -0.015 |
| tALPS | ACBD4 | ast | 0.000 | -0.019 | none | 0.000 | -0.006 |
| tALPS | NMT1 | ex | 1.774 | -0.025 | Ab | 1.783 | -0.016 |
| tALPS | HEXIM | ex | 1.739 | -0.034 | none | 0.000 | -0.004 |
| tALPS | MAPT | ex | 1.942 | -0.044 | both | 1.841 | -0.035 |