

Supplementary Table 1. Gene-based association of circadian genes with bipolar I disorder (BPI)

| Gene | SNPs (n) | Disorder | Model | χ^2 | p-value |
|-----------------|-----------------|-----------------|--------------|----------------------------|----------------|
| <i>ANAT</i> | 4 | BPI | A | 1.997 | 0.482 |
| <i>AANAT</i> | 4 | BPI | D | 1.811 | 0.538 |
| <i>AANAT</i> | 4 | BPI | R | 1.818 | 0.550 |
| <i>ARNTL</i> | 22 | BPI | A | 4.293 | 0.422 |
| <i>ARNTL</i> | 22 | BPI | D | 4.050 | 0.566 |
| <i>ARNTL</i> | 22 | BPI | R | 2.854 | 0.800 |
| <i>ARNTL2</i> | 25 | BPI | R | 4.067 | 0.559 |
| <i>ARNTL2</i> | 25 | BPI | D | 4.068 | 0.591 |
| <i>ARNTL2</i> | 25 | BPI | A | 3.171 | 0.699 |
| <i>BHLHB3</i> | 4 | BPI | A | 0.786 | 0.708 |
| <i>BHLHB3</i> | 4 | BPI | D | 0.860 | 0.717 |
| <i>BHLHB3</i> | 4 | BPI | R | 0.471 | 0.868 |
| <i>CLOCK</i> | 10 | BPI | D | 5.096 | 0.142 |
| <i>CLOCK</i> | 10 | BPI | R | 3.578 | 0.434 |
| <i>CLOCK</i> | 10 | BPI | A | 2.556 | 0.524 |
| <i>CNR1</i> | 17 | BPI | R | 4.971 | 0.304 |
| <i>CNR1</i> | 17 | BPI | D | 3.233 | 0.623 |
| <i>CNR1</i> | 17 | BPI | A | 2.629 | 0.643 |
| <i>CRY2</i> | 7 | BPI | R | 5.443 | 0.119 |
| <i>CRY2</i> | 7 | BPI | A | 4.967 | 0.133 |
| <i>CRY2</i> | 7 | BPI | D | 1.486 | 0.768 |
| <i>CSNK1D</i> | 1 | BPI | R | 3.077 | 0.125 |
| <i>CSNK1D</i> | 1 | BPI | A | 0.286 | 0.613 |
| <i>CSNK1D</i> | 1 | BPI | D | 0.001 | 1.000 |
| <i>CSNK1E</i> | 9 | BPI | R | 6.251 | 0.098 |
| <i>CSNK1E</i> | 9 | BPI | A | 5.354 | 0.140 |
| <i>CSNK1E</i> | 9 | BPI | D | 3.728 | 0.354 |
| <i>CSNK2A1</i> | 7 | BPI | D | 5.274 | 0.136 |
| <i>CSNK2A1</i> | 7 | BPI | R | 2.372 | 0.551 |
| <i>CSNK2A1</i> | 7 | BPI | A | 1.527 | 0.687 |
| <i>DBP</i> | 2 | BPI | R | 2.109 | 0.273 |
| <i>DBP</i> | 2 | BPI | D | 1.578 | 0.377 |
| <i>DBP</i> | 2 | BPI | A | 0.703 | 0.632 |
| <i>EGR3</i> | 3 | BPI | R | 7.248 | 0.014 |
| <i>EGR3</i> | 3 | BPI | A | 7.659 | 0.020 |
| <i>EGR3</i> | 3 | BPI | D | 2.613 | 0.288 |
| <i>FLJ20516</i> | 5 | BPI | D | 4.334 | 0.184 |
| <i>FLJ20516</i> | 5 | BPI | A | 3.796 | 0.209 |
| <i>FLJ20516</i> | 5 | BPI | R | 1.885 | 0.608 |
| <i>NFIL3</i> | 9 | BPI | D | 3.129 | 0.448 |
| <i>NFIL3</i> | 9 | BPI | A | 2.497 | 0.575 |
| <i>NFIL3</i> | 9 | BPI | R | 2.136 | 0.699 |
| <i>NPAS2</i> | 60 | BPI | A | 6.629 | 0.326 |
| <i>NPAS2</i> | 60 | BPI | D | 5.686 | 0.553 |
| <i>NPAS2</i> | 60 | BPI | R | 5.077 | 0.701 |

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|-----------------|----|-----|---|-------|-------|
| <i>NR1D1</i> | 6 | BPI | D | 2.973 | 0.385 |
| <i>NR1D1</i> | 6 | BPI | R | 3.107 | 0.409 |
| <i>NR1D1</i> | 6 | BPI | A | 2.316 | 0.456 |
| <i>PER1</i> | 2 | BPI | R | 4.005 | 0.111 |
| <i>PER1</i> | 2 | BPI | D | 0.810 | 0.544 |
| <i>PER1</i> | 2 | BPI | A | 0.150 | 0.893 |
| <i>PER2</i> | 9 | BPI | R | 7.226 | 0.062 |
| <i>PER2</i> | 9 | BPI | A | 3.587 | 0.336 |
| <i>PER2</i> | 9 | BPI | D | 1.828 | 0.849 |
| <i>PER3</i> | 14 | BPI | R | 3.663 | 0.487 |
| <i>PER3</i> | 14 | BPI | D | 2.145 | 0.784 |
| <i>PER3</i> | 14 | BPI | A | 1.500 | 0.847 |
| <i>RORB</i> | 46 | BPI | R | 7.436 | 0.203 |
| <i>RORB</i> | 46 | BPI | D | 5.403 | 0.475 |
| <i>RORB</i> | 46 | BPI | A | 4.907 | 0.500 |
| <i>TIMELESS</i> | 6 | BPI | R | 3.072 | 0.271 |
| <i>TIMELESS</i> | 6 | BPI | A | 0.332 | 0.968 |
| <i>TIMELESS</i> | 6 | BPI | D | 0.251 | 0.993 |

SNP = single nucleotide polymorphism.

Supplementary Table 2. Gene-based association of circadian genes with schizophrenia (SZ)/schizoaffective disorder (SZA)

| Gene | Count of SNPs | Disorder | Model | χ^2 | p-value |
|-------------|----------------------|-----------------|--------------|----------------------------|----------------|
| AANAT | 4 | SZ/SZA | A | 3.101 | 0.268 |
| AANAT | 4 | SZ/SZA | D | 2.817 | 0.340 |
| AANAT | 4 | SZ/SZA | R | 2.747 | 0.345 |
| ARNTL | 22 | SZ/SZA | A | 3.334 | 0.621 |
| ARNTL | 22 | SZ/SZA | R | 2.424 | 0.882 |
| ARNTL | 22 | SZ/SZA | D | 2.346 | 0.913 |
| ARNTL2 | 25 | SZ/SZA | D | 6.360 | 0.196 |
| ARNTL2 | 25 | SZ/SZA | R | 4.700 | 0.434 |
| ARNTL2 | 25 | SZ/SZA | A | 3.236 | 0.678 |
| BHLHB3 | 4 | SZ/SZA | R | 0.600 | 0.829 |
| BHLHB3 | 4 | SZ/SZA | D | 0.282 | 0.940 |
| BHLHB3 | 4 | SZ/SZA | A | 0.100 | 0.985 |
| CLOCK | 10 | SZ/SZA | A | 1.830 | 0.708 |
| CLOCK | 10 | SZ/SZA | D | 2.214 | 0.730 |
| CLOCK | 10 | SZ/SZA | R | 1.351 | 0.908 |
| CNR1 | 17 | SZ/SZA | A | 3.898 | 0.389 |
| CNR1 | 17 | SZ/SZA | D | 4.189 | 0.404 |
| CNR1 | 17 | SZ/SZA | R | 1.603 | 0.957 |
| CRY2 | 7 | SZ/SZA | A | 1.267 | 0.767 |
| CRY2 | 7 | SZ/SZA | R | 1.576 | 0.788 |
| CRY2 | 7 | SZ/SZA | D | 0.701 | 0.954 |
| CSNK1D | 1 | SZ/SZA | A | 2.253 | 0.137 |
| CSNK1D | 1 | SZ/SZA | D | 2.015 | 0.173 |
| CSNK1D | 1 | SZ/SZA | R | 0.733 | 0.425 |
| CSNK1E | 9 | SZ/SZA | D | 3.815 | 0.347 |
| CSNK1E | 9 | SZ/SZA | R | 2.768 | 0.564 |
| CSNK1E | 9 | SZ/SZA | A | 1.423 | 0.814 |

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|-----------------|----|--------|---|--------|-------|
| <i>CSNK2A1</i> | 7 | SZ/SZA | R | 3.126 | 0.381 |
| <i>CSNK2A1</i> | 7 | SZ/SZA | D | 2.752 | 0.470 |
| <i>CSNK2A1</i> | 7 | SZ/SZA | A | 1.354 | 0.719 |
| <i>DBP</i> | 2 | SZ/SZA | D | 2.864 | 0.173 |
| <i>DBP</i> | 2 | SZ/SZA | R | 2.134 | 0.251 |
| <i>DBP</i> | 2 | SZ/SZA | A | 1.570 | 0.371 |
| <i>EGR3</i> | 3 | SZ/SZA | R | 1.294 | 0.469 |
| <i>EGR3</i> | 3 | SZ/SZA | A | 1.601 | 0.495 |
| <i>EGR3</i> | 3 | SZ/SZA | D | 0.774 | 0.759 |
| <i>FLJ20516</i> | 5 | SZ/SZA | R | 5.296 | 0.108 |
| <i>FLJ20516</i> | 5 | SZ/SZA | A | 3.515 | 0.237 |
| <i>FLJ20516</i> | 5 | SZ/SZA | D | 3.622 | 0.319 |
| <i>NFIL3</i> | 9 | SZ/SZA | D | 4.240 | 0.276 |
| <i>NFIL3</i> | 9 | SZ/SZA | R | 3.605 | 0.369 |
| <i>NFIL3</i> | 9 | SZ/SZA | A | 3.128 | 0.438 |
| <i>NPAS2</i> | 60 | SZ/SZA | R | 11.321 | 0.034 |
| <i>NPAS2</i> | 60 | SZ/SZA | D | 7.892 | 0.205 |
| <i>NPAS2</i> | 60 | SZ/SZA | A | 5.146 | 0.558 |
| <i>NR1D1</i> | 6 | SZ/SZA | R | 4.633 | 0.182 |
| <i>NR1D1</i> | 6 | SZ/SZA | D | 2.144 | 0.543 |
| <i>NR1D1</i> | 6 | SZ/SZA | A | 0.572 | 0.945 |
| <i>PER1</i> | 2 | SZ/SZA | R | 1.525 | 0.481 |
| <i>PER1</i> | 2 | SZ/SZA | D | 0.596 | 0.640 |
| <i>PER1</i> | 2 | SZ/SZA | A | 0.389 | 0.725 |
| <i>PER2</i> | 9 | SZ/SZA | R | 6.944 | 0.068 |
| <i>PER2</i> | 9 | SZ/SZA | A | 4.563 | 0.209 |
| <i>PER2</i> | 9 | SZ/SZA | D | 1.671 | 0.769 |
| <i>PER3</i> | 14 | SZ/SZA | A | 4.723 | 0.245 |
| <i>PER3</i> | 14 | SZ/SZA | D | 4.379 | 0.319 |
| <i>PER3</i> | 14 | SZ/SZA | R | 4.420 | 0.349 |
| <i>RORB</i> | 46 | SZ/SZA | D | 9.945 | 0.056 |
| <i>RORB</i> | 46 | SZ/SZA | A | 5.510 | 0.407 |
| <i>RORB</i> | 46 | SZ/SZA | R | 4.505 | 0.699 |
| <i>TIMELESS</i> | 6 | SZ/SZA | R | 3.823 | 0.210 |
| <i>TIMELESS</i> | 6 | SZ/SZA | A | 3.599 | 0.220 |

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|-----------------|---|--------|---|-------|-------|
| <i>TIMELESS</i> | 6 | SZ/SZA | D | 3.378 | 0.298 |
|-----------------|---|--------|---|-------|-------|

SNP = single nucleotide polymorphism.

Supplementary Table 3. Associations between single nucleotide polymorphisms and body mass index (BMI), age at onset (AAO), and presence or absence of psychosis among the bipolar I disorder (BPI) cases

| Gene | Association with BPI | BMI p-value | AAO p-value | Psychosis versus controls | No psychosis versus controls | Psychosis versus no psychosis |
|-----------------|-----------------------------|--------------------|--------------------|----------------------------------|-------------------------------------|--------------------------------------|
| <i>ARNTL</i> | 0.057 | 0.594 | 0.997 | 0.023 | 0.6531 | 0.0773 |
| <i>ARNTL</i> | 0.038 | 0.456 | 0.777 | 0.018 | 0.9894 | 0.1662 |
| <i>ARNTL</i> | 0.884 | 0.030 | 0.550 | 0.852 | 0.9861 | 0.8978 |
| <i>ARNTL</i> | 0.417 | 0.003 | 0.806 | 0.377 | 0.5947 | 0.9939 |
| <i>ARNTL2</i> | 0.260 | 0.926 | 0.444 | 0.054 | 0.2238 | 0.0279 |
| <i>ARNTL2</i> | 0.739 | 0.750 | 0.723 | 0.710 | 0.0608 | 0.03345 |
| <i>ARNTL2</i> | 0.880 | 0.040 | 0.116 | 0.685 | 0.2793 | 0.1939 |
| <i>ARNTL2</i> | 0.075 | 0.443 | 0.200 | 0.186 | 0.04827 | 0.2164 |
| <i>ARNTL2</i> | 0.775 | 0.530 | 0.016 | 0.918 | 0.3851 | 0.3518 |
| <i>CLOCK</i> | 0.413 | 0.129 | 0.372 | 0.905 | 0.02774 | 0.02349 |
| <i>CNR1</i> | 0.120 | 0.980 | 0.971 | 0.046 | 0.734 | 0.3988 |
| <i>CNR1</i> | 0.105 | 0.966 | 0.947 | 0.043 | 0.673 | 0.4311 |
| <i>CRY2</i> | 0.546 | 0.019 | 0.001 | 0.845 | 0.2263 | 0.2728 |
| <i>CRY2</i> | 0.508 | 0.011 | 0.978 | 0.825 | 0.3407 | 0.4121 |
| <i>CRY2</i> | 0.604 | 0.567 | 0.008 | 0.858 | 0.3819 | 0.4703 |
| <i>CRY2</i> | 0.094 | 0.351 | 0.511 | 0.044 | 0.5373 | 0.5568 |
| <i>CRY2</i> | 0.026 | 0.372 | 0.175 | 0.019 | 0.09421 | 0.7322 |
| <i>CRY2</i> | 0.329 | 0.259 | 0.005 | 0.348 | 0.5551 | 0.9885 |
| <i>CSNK1E</i> | 0.804 | 0.303 | 0.364 | 0.199 | 0.03028 | 0.001948 |
| <i>CSNK1E</i> | 0.392 | 0.203 | 0.608 | 0.104 | 0.1575 | 0.01235 |
| <i>CSNK1E</i> | 0.021 | 0.145 | 0.055 | 0.055 | 0.01691 | 0.2531 |
| <i>CSNK1E</i> | 0.050 | 0.568 | 0.062 | 0.097 | 0.0334 | 0.2661 |
| <i>CSNK2A1</i> | 0.489 | 0.350 | 0.385 | 0.812 | 0.03017 | 0.06449 |
| <i>CSNK2A1</i> | 0.346 | 0.069 | 0.567 | 0.815 | 0.04345 | 0.06672 |
| <i>EGR3</i> | 0.006 | 0.343 | 0.442 | 0.003 | 0.08027 | 0.9968 |
| <i>FLJ20516</i> | 0.051 | 0.804 | 0.570 | 0.046 | 0.4063 | 0.7021 |
| <i>NFIL3</i> | 0.616 | 0.007 | 0.494 | 0.599 | 0.5722 | 0.3839 |
| <i>NFIL3</i> | 0.322 | 0.046 | 0.958 | 0.305 | 0.6985 | 0.8136 |
| <i>NPAS2</i> | 0.601 | 0.861 | 0.048 | 0.737 | 0.01469 | 0.0108 |
| <i>NPAS2</i> | 0.909 | 0.203 | 0.971 | 0.570 | 0.02542 | 0.01397 |
| <i>NPAS2</i> | 0.463 | 0.190 | 0.709 | 0.167 | 0.1942 | 0.02635 |

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|-------|-------|-------|-------|-------|---------|---------|
| NPAS2 | 0.828 | 0.388 | 0.260 | 0.694 | 0.05169 | 0.03619 |
| NPAS2 | 0.745 | 0.357 | 0.631 | 0.865 | 0.04439 | 0.03813 |
| NPAS2 | 0.482 | 0.788 | 0.760 | 0.912 | 0.04083 | 0.05618 |
| NPAS2 | 0.606 | 0.044 | 0.863 | 0.915 | 0.07724 | 0.07277 |
| NPAS2 | 0.010 | 0.370 | 0.197 | 0.001 | 0.7912 | 0.09745 |
| NPAS2 | 0.549 | 0.022 | 0.775 | 0.839 | 0.1722 | 0.1304 |
| NPAS2 | 0.100 | 0.809 | 0.110 | 0.316 | 0.04487 | 0.1635 |
| NPAS2 | 0.208 | 0.210 | 0.048 | 0.454 | 0.05809 | 0.1669 |
| NPAS2 | 0.747 | 0.011 | 0.295 | 0.466 | 0.401 | 0.2026 |
| NPAS2 | 0.737 | 0.008 | 0.050 | 0.546 | 0.6728 | 0.4325 |
| NPAS2 | 0.035 | 0.660 | 0.427 | 0.028 | 0.4605 | 0.5564 |
| NPAS2 | 0.154 | 0.329 | 0.765 | 0.157 | 0.1531 | 0.5703 |
| NPAS2 | 0.196 | 0.244 | 0.026 | 0.250 | 0.2509 | 0.706 |
| NPAS2 | 0.018 | 0.654 | 0.837 | 0.050 | 0.1121 | 0.7204 |
| NPAS2 | 0.688 | 0.015 | 0.089 | 0.681 | 0.9883 | 0.8184 |
| NPAS2 | 0.798 | 0.030 | 0.232 | 0.927 | 0.9732 | 0.9329 |
| NPAS2 | 0.883 | 0.028 | 0.547 | 0.771 | 0.9181 | 0.9409 |
| NR1D1 | 0.240 | 0.029 | 0.246 | 0.063 | 0.4445 | 0.07093 |
| NR1D1 | 0.432 | 0.242 | 0.020 | 0.578 | 0.4125 | 0.6267 |
| PER1 | 0.698 | 0.620 | 0.023 | 0.481 | 0.7613 | 0.4834 |
| PER2 | 0.192 | 0.065 | 0.126 | 0.646 | 0.01553 | 0.03398 |
| PER2 | 0.058 | 0.237 | 0.593 | 0.202 | 0.03197 | 0.1589 |
| PER2 | 0.311 | 0.024 | 0.991 | 0.455 | 0.2444 | 0.4781 |
| PER2 | 0.964 | 0.001 | 0.253 | 0.999 | 0.4951 | 0.4914 |
| PER2 | 0.175 | 0.017 | 0.989 | 0.258 | 0.3751 | 0.8414 |
| PER3 | 0.251 | 0.885 | 0.918 | 0.581 | 0.02877 | 0.05345 |
| PER3 | 0.290 | 0.765 | 0.435 | 0.646 | 0.03328 | 0.05691 |
| PER3 | 0.359 | 0.851 | 0.527 | 0.677 | 0.04752 | 0.1015 |
| PER3 | 0.442 | 0.896 | 0.016 | 0.628 | 0.06436 | 0.1173 |
| PER3 | 0.514 | 0.740 | 0.979 | 0.663 | 0.1515 | 0.2553 |
| PER3 | 0.787 | 0.564 | 0.034 | 0.864 | 0.6148 | 0.7098 |
| PER3 | 0.693 | 0.579 | 0.009 | 0.640 | 0.7046 | 0.9275 |
| PER3 | 0.534 | 0.549 | 0.049 | 0.438 | 0.6518 | 0.9874 |
| RORB | 0.027 | 0.755 | 0.657 | 0.021 | 0.9952 | 0.1689 |
| RORB | 0.037 | 0.616 | 0.104 | 0.189 | 0.05976 | 0.2029 |
| RORB | 0.906 | 0.041 | 0.603 | 0.666 | 0.5593 | 0.4354 |
| RORB | 0.671 | 0.220 | 0.002 | 0.477 | 0.8406 | 0.5309 |
| RORB | 0.610 | 0.087 | 0.025 | 0.948 | 0.579 | 0.6113 |

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|-------------|-------|-------|-------|-------|--------|--------|
| <i>RORB</i> | 0.801 | 0.038 | 0.698 | 0.740 | 0.8129 | 0.6756 |
| <i>RORB</i> | 0.027 | 0.670 | 0.989 | 0.069 | 0.4683 | 0.6976 |
| <i>RORB</i> | 0.484 | 0.093 | 0.006 | 0.472 | 0.6427 | 0.9794 |

None of the associations remained significant following Bonferroni corrections for multiple comparisons.