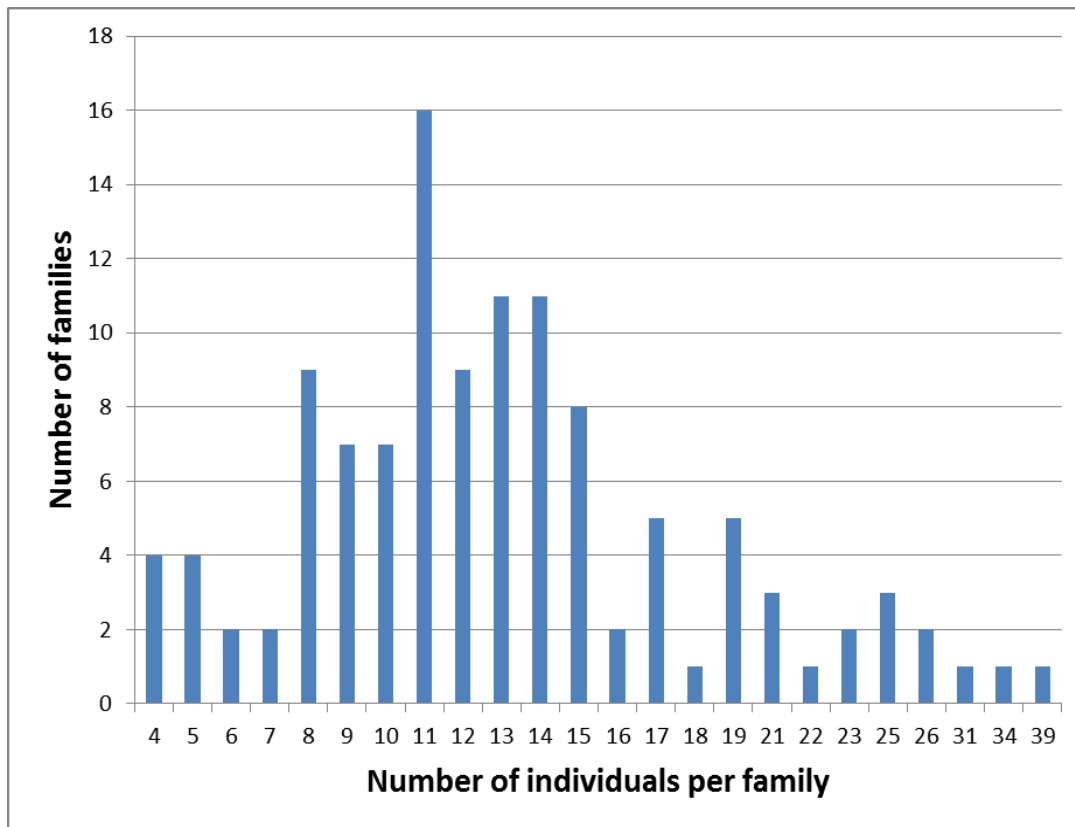
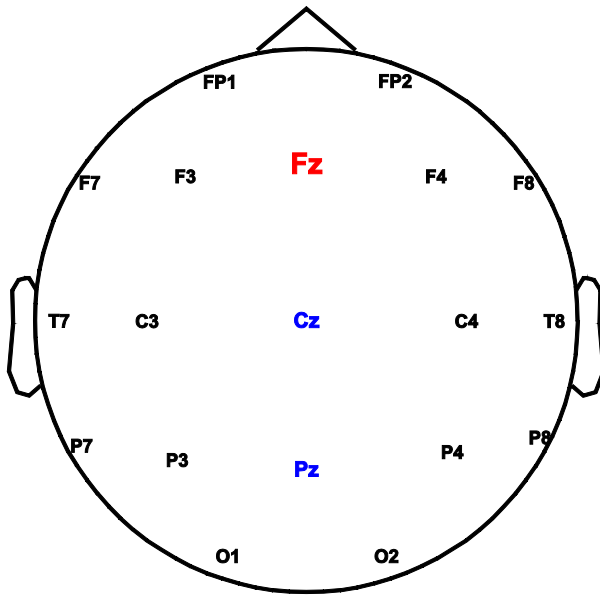
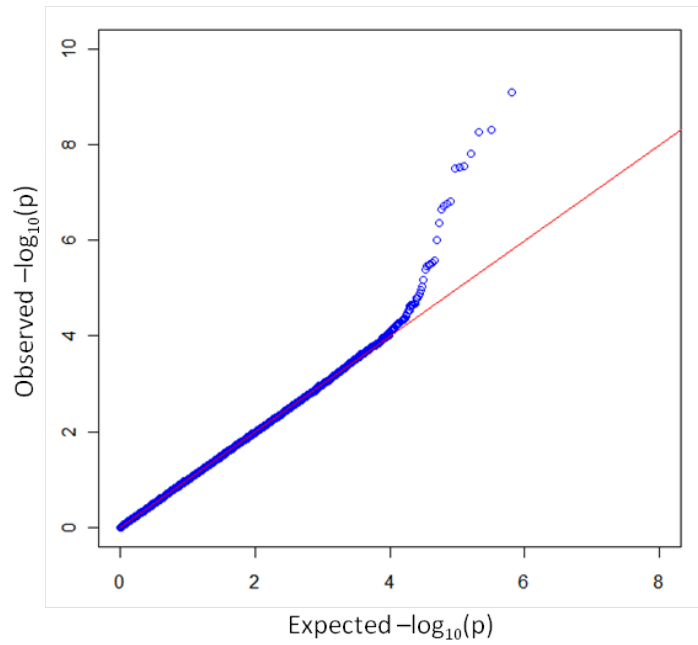


Supplementary Figure S1. Distribution of family sizes in the GWAS sample.

Supplementary Figure S2. Headplot of placement of nineteen electrodes of 10-20 International System recording EEG/ERO activity from the surface of the scalp. The frontal midline electrode (Fz) where theta ERO phenotype was recorded is highlighted in red, and the central midline (Cz) and parietal midline (Pz) electrodes where theta EROs were recorded for secondary analysis are highlighted in blue.



Supplementary Figure S3. Quantile-Quantile plot of GWAS results for theta power at Fz.
The genomic control inflation factor λ is 1.00.



Supplementary Table S1. Imputed SNPs in *KCNJ6* with $p < 1 \times 10^{-5}$ associated with theta power at Fz.

| SNP | BP | A1 | A2 | Freq1 | Effect | P |
|-------------|------------|----|----|-------|--------|------------------------|
| rs2835880 | 39,032,477 | A | G | 0.68 | -0.148 | 2.80×10^{-10} |
| rs2835872 | 39,027,272 | G | A | 0.681 | -0.145 | 4.70×10^{-10} |
| rs10483038 | 39,024,771 | T | C | 0.681 | -0.144 | 6.60×10^{-10} |
| rs73222345 | 39,036,569 | G | A | 0.646 | -0.140 | 1.40×10^{-9} |
| rs857976 | 39,001,177 | A | C | 0.696 | -0.140 | 2.30×10^{-9} |
| rs857947 | 39,008,539 | T | C | 0.699 | -0.139 | 3.10×10^{-9} |
| rs702860 | 39,008,629 | T | C | 0.699 | -0.139 | 3.10×10^{-9} |
| rs857946 | 39,009,303 | T | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs2835848 | 39,011,073 | C | T | 0.699 | -0.139 | 3.10×10^{-9} |
| rs2835849 | 39,011,524 | T | C | 0.699 | -0.139 | 3.10×10^{-9} |
| rs73222307 | 39,012,225 | G | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs717859 | 39,012,802 | G | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs73222309 | 39,013,686 | C | T | 0.699 | -0.139 | 3.10×10^{-9} |
| rs2835852 | 39,014,128 | G | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs73222314 | 39,014,802 | A | G | 0.699 | -0.139 | 3.10×10^{-9} |
| rs2835853 | 39,014,892 | C | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs2835855 | 39,015,754 | T | A | 0.699 | -0.139 | 3.10×10^{-9} |
| rs1475839 | 39,021,941 | C | T | 0.692 | -0.141 | 3.10×10^{-9} |
| rs2835850 | 39,012,977 | T | C | 0.699 | -0.139 | 3.50×10^{-9} |
| rs111372083 | 39,010,676 | C | T | 0.699 | -0.138 | 3.70×10^{-9} |
| rs857973 | 39,007,498 | G | A | 0.697 | -0.137 | 5.50×10^{-9} |

| | | | | | | |
|------------|------------|---|---|-------|--------|-----------------------|
| rs721014 | 39,008,109 | G | A | 0.697 | -0.137 | 5.60×10^{-9} |
| rs2154553 | 39,004,501 | A | G | 0.696 | -0.136 | 6.70×10^{-9} |
| rs857974 | 39,005,741 | G | A | 0.696 | -0.136 | 6.70×10^{-9} |
| rs17814920 | 39,015,897 | G | A | 0.697 | -0.137 | 6.80×10^{-9} |
| rs66815183 | 39,032,828 | C | T | 0.703 | -0.142 | 7.20×10^{-9} |
| rs1515050 | 39,003,142 | C | T | 0.696 | -0.135 | 8.00×10^{-9} |
| rs1787331 | 39,003,525 | G | T | 0.696 | -0.135 | 8.00×10^{-9} |
| rs857975 | 39,001,613 | G | T | 0.696 | -0.135 | 8.30×10^{-9} |
| rs1787330 | 39,002,787 | A | G | 0.696 | -0.135 | 8.30×10^{-9} |
| rs702859 | 38,997,701 | A | G | 0.679 | -0.130 | 1.60×10^{-8} |
| rs857979 | 38,998,093 | G | A | 0.679 | -0.130 | 1.60×10^{-8} |
| rs2835838 | 38,990,994 | A | G | 0.678 | -0.129 | 1.70×10^{-8} |
| rs2835839 | 38,991,034 | T | C | 0.678 | -0.129 | 1.70×10^{-8} |
| rs2835840 | 38,991,321 | G | C | 0.678 | -0.129 | 1.70×10^{-8} |
| rs857980 | 38,995,142 | A | G | 0.678 | -0.130 | 1.70×10^{-8} |
| rs702858 | 38,995,169 | G | A | 0.678 | -0.130 | 1.70×10^{-8} |
| rs73220488 | 38,987,025 | C | T | 0.684 | -0.130 | 1.80×10^{-8} |
| rs2835831 | 38,987,233 | T | C | 0.684 | -0.130 | 1.80×10^{-8} |
| rs73220491 | 38,988,323 | T | G | 0.683 | -0.129 | 1.80×10^{-8} |
| rs4816568 | 38,988,346 | A | G | 0.683 | -0.129 | 1.80×10^{-8} |
| rs2835836 | 38,989,187 | A | C | 0.683 | -0.130 | 1.80×10^{-8} |
| rs75938265 | 38,987,039 | C | T | 0.683 | -0.129 | 1.90×10^{-8} |
| rs2835833 | 38,987,897 | G | A | 0.683 | -0.129 | 2.00×10^{-8} |
| rs4816567 | 38,988,155 | T | C | 0.683 | -0.129 | 2.00×10^{-8} |

| | | | | | | |
|-------------|------------|---|---|-------|--------|-----------------------|
| rs4817877 | 38,988,393 | G | C | 0.683 | -0.129 | 2.00×10^{-8} |
| rs2835835 | 38,989,072 | G | A | 0.682 | -0.129 | 2.10×10^{-8} |
| rs2835837 | 38,990,443 | G | A | 0.681 | -0.129 | 2.10×10^{-8} |
| rs857978 | 38,998,126 | G | A | 0.678 | -0.128 | 2.20×10^{-8} |
| rs3827195 | 39,049,817 | C | T | 0.665 | -0.130 | 2.70×10^{-8} |
| rs73220495 | 38,989,712 | G | A | 0.681 | -0.128 | 2.80×10^{-8} |
| rs73220494 | 38,989,276 | C | T | 0.680 | -0.127 | 2.90×10^{-8} |
| rs111576572 | 38,989,564 | A | G | 0.680 | -0.127 | 2.90×10^{-8} |
| rs67739865 | 39,049,101 | G | A | 0.665 | -0.129 | 3.30×10^{-8} |
| rs1787402 | 39,038,990 | T | C | 0.6 | -0.123 | 4.00×10^{-8} |
| rs8126563 | 39,052,624 | C | T | 0.665 | -0.128 | 4.00×10^{-8} |
| rs2835893 | 39,060,893 | G | A | 0.672 | -0.126 | 6.10×10^{-8} |
| rs2835894 | 39,066,042 | A | G | 0.671 | -0.126 | 7.00×10^{-8} |
| rs1787406 | 39,051,168 | A | C | 0.504 | 0.119 | 7.40×10^{-8} |
| rs2835895 | 39,066,353 | C | T | 0.671 | -0.126 | 7.50×10^{-8} |
| rs2835896 | 39,066,640 | C | T | 0.671 | -0.126 | 7.50×10^{-8} |
| rs1709826 | 39,049,473 | A | G | 0.505 | 0.119 | 8.50×10^{-8} |
| rs2835888 | 39,049,859 | T | C | 0.535 | 0.119 | 8.70×10^{-8} |
| rs1399590 | 39,054,071 | A | G | 0.503 | 0.119 | 9.00×10^{-8} |
| rs1399591 | 39,053,957 | T | C | 0.504 | 0.118 | 1.00×10^{-7} |
| rs4452239 | 39,052,655 | G | T | 0.503 | 0.118 | 1.10×10^{-7} |
| rs4477996 | 39,052,666 | T | C | 0.503 | 0.118 | 1.10×10^{-7} |
| rs2835900 | 39,075,749 | G | T | 0.671 | -0.123 | 1.10×10^{-7} |
| rs12482570 | 39,077,777 | A | G | 0.671 | -0.123 | 1.10×10^{-7} |

| | | | | | | |
|------------|------------|---|---|-------|--------|-----------------------|
| rs2835910 | 39,085,907 | C | T | 0.67 | -0.122 | 1.10×10^{-7} |
| rs1515056 | 39,082,585 | C | G | 0.671 | -0.122 | 1.20×10^{-7} |
| rs1399592 | 39,053,862 | T | G | 0.534 | 0.117 | 1.30×10^{-7} |
| rs1888467 | 39,052,780 | G | T | 0.534 | 0.117 | 1.40×10^{-7} |
| rs724545 | 39,052,878 | G | T | 0.534 | 0.117 | 1.40×10^{-7} |
| rs62221645 | 39,071,226 | T | C | 0.671 | -0.123 | 1.40×10^{-7} |
| rs2835898 | 39,071,781 | T | C | 0.671 | -0.123 | 1.40×10^{-7} |
| rs7278101 | 39,035,873 | T | C | 0.594 | -0.111 | 6.60×10^{-7} |
| rs4817881 | 39,031,902 | C | T | 0.516 | 0.109 | 7.90×10^{-7} |
| rs1709819 | 39,036,115 | C | A | 0.565 | -0.108 | 8.60×10^{-7} |
| rs8134288 | 39,036,989 | C | T | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1787397 | 39,037,378 | G | A | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1787398 | 39,037,504 | C | A | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1709835 | 39,037,636 | G | A | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1709833 | 39,037,805 | G | A | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1787399 | 39,037,883 | G | A | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1709832 | 39,038,167 | G | T | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1787400 | 39,038,217 | C | G | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1787401 | 39,038,893 | T | C | 0.563 | -0.108 | 8.60×10^{-7} |
| rs1709820 | 39,035,971 | C | A | 0.563 | -0.108 | 8.70×10^{-7} |
| rs1787394 | 39,036,176 | A | C | 0.563 | -0.108 | 8.70×10^{-7} |
| rs1709818 | 39,036,211 | C | T | 0.563 | -0.108 | 8.70×10^{-7} |
| rs1709817 | 39,036,349 | A | T | 0.563 | -0.108 | 8.70×10^{-7} |
| rs1787395 | 39,036,478 | C | A | 0.563 | -0.108 | 8.70×10^{-7} |

| | | | | | | |
|------------|------------|---|---|-------|--------|-----------------------|
| rs1787396 | 39,036,487 | C | A | 0.563 | -0.108 | 8.70×10^{-7} |
| rs1787404 | 39,049,362 | G | A | 0.622 | -0.111 | 9.30×10^{-7} |
| rs2835881 | 39,033,131 | G | A | 0.548 | 0.109 | 9.80×10^{-7} |
| rs1787393 | 39,035,934 | A | G | 0.563 | -0.106 | 1.30×10^{-6} |
| rs2850123 | 39,034,762 | C | T | 0.567 | -0.107 | 1.40×10^{-6} |
| rs1709822 | 39,035,485 | G | A | 0.564 | -0.106 | 1.50×10^{-6} |
| rs1709821 | 39,035,622 | C | T | 0.564 | -0.106 | 1.50×10^{-6} |
| rs8133572 | 39,041,923 | C | G | 0.589 | 0.105 | 2.20×10^{-6} |
| rs4816576 | 39,042,259 | G | A | 0.589 | 0.105 | 2.20×10^{-6} |
| rs11700477 | 39,043,011 | C | G | 0.584 | 0.103 | 3.90×10^{-6} |
| rs858008 | 39,065,630 | G | A | 0.512 | 0.099 | 4.30×10^{-6} |
| rs2835903 | 39,077,237 | G | C | 0.546 | 0.101 | 4.30×10^{-6} |
| rs1787423 | 39,016,910 | G | C | 0.509 | -0.101 | 4.50×10^{-6} |
| rs2835886 | 39,040,342 | C | T | 0.586 | 0.101 | 4.50×10^{-6} |
| rs2835887 | 39,040,359 | T | C | 0.586 | 0.101 | 4.50×10^{-6} |
| rs1008542 | 39,040,561 | G | A | 0.586 | 0.101 | 4.50×10^{-6} |
| rs1008543 | 39,040,776 | G | A | 0.586 | 0.101 | 4.50×10^{-6} |
| rs1008544 | 39,040,869 | T | C | 0.586 | 0.101 | 4.50×10^{-6} |
| rs9982323 | 39,041,628 | G | A | 0.586 | 0.101 | 4.50×10^{-6} |
| rs8134478 | 39,041,817 | T | G | 0.586 | 0.101 | 4.50×10^{-6} |
| rs2835901 | 39,076,914 | C | T | 0.545 | 0.100 | 4.60×10^{-6} |
| rs12233305 | 39,046,853 | C | A | 0.588 | 0.103 | 5.20×10^{-6} |
| rs1005546 | 39,068,872 | G | A | 0.545 | 0.100 | 5.20×10^{-6} |
| rs1005545 | 39,069,197 | C | G | 0.545 | 0.100 | 5.50×10^{-6} |

| | | | | | | |
|-----------|------------|---|---|-------|--------|-----------------------|
| rs2673014 | 39,034,789 | G | A | 0.575 | -0.102 | 5.60×10^{-6} |
| rs2835899 | 39,075,494 | A | T | 0.544 | 0.100 | 5.60×10^{-6} |
| rs2835906 | 39,082,804 | T | C | 0.591 | 0.098 | 7.70×10^{-6} |

^a A1 is the reference allele.

^b Freq. is the allele frequency of the reference allele A1.

^c Effect is the effect of the reference allele A1 on the phenotype theta power recorded at Fz.

Supplementary Table S2. SNPs in *CHRM2* and *GRM8* with $p < 0.05$ associated with theta power at Fz.

| chr | gene | function | SNP | BP | A1 ^a | A2 | Freq ^b | Effect ^c | p |
|-----|-------|----------|------------|-------------|-----------------|----|-------------------|---------------------|-----------------------|
| 7 | GRM8 | intron | rs13247338 | 12,6090,509 | T | C | 0.155 | -0.069 | 2.90×10^{-2} |
| 7 | GRM8 | intron | rs2299456 | 126,168,766 | C | T | 0.164 | -0.064 | 3.10×10^{-2} |
| 7 | GRM8 | intron | rs11767915 | 126,288,566 | C | T | 0.148 | -0.067 | 4.00×10^{-2} |
| 7 | GRM8 | intron | rs4731334 | 126,514,557 | C | T | 0.100 | -0.112 | 2.30×10^{-3} |
| 7 | GRM8 | intron | rs978874 | 126,664,152 | T | C | 0.691 | 0.056 | 1.80×10^{-2} |
| 7 | GRM8 | intron | rs2237785 | 126,717,992 | A | C | 0.607 | 0.044 | 4.80×10^{-2} |
| 7 | CHRM2 | intron | rs10954565 | 136,560,248 | G | A | 0.776 | 0.071 | 7.90×10^{-3} |
| 7 | CHRM2 | intron | rs4475425 | 136,575,199 | A | G | 0.233 | 0.054 | 4.10×10^{-2} |

^a A1 is the reference allele.

^b Freq. is the allele frequency of the reference allele A1.

^c Effect is the effect of the reference allele A1 on the phenotype theta power recorded at Fz.