



Supplementary Materials

Table S1. Genotype effects on brain curvature.

| Gene | SNPs | Age-adjusted/FDR | | | | | | | | | |
|--------------|-----------|-----------------------------|----------------------------|-----------------------|---------------------------|-------------------------|-----------------------------|----------------------------|-----------------------|---------------------------|-------------------------|
| | | Left Hemisphere | | | | | Right Hemisphere | | | | |
| | | Lateral Orbitofrontal Gyrus | Medial Orbitofrontal Gyrus | Parahippocampal Gyrus | Posterior Cingulate Gyrus | Superior Temporal Gyrus | Lateral Orbitofrontal Gyrus | Medial Orbitofrontal Gyrus | Parahippocampal Gyrus | Posterior Cingulate Gyrus | Superior Temporal Gyrus |
| <i>OXTR</i> | rs1042778 | 0.850/0.982 | 0.033/0.414 | 0.899/0.981 | 0.680/0.765 | 0.080/0.240 | 0.098/0.528 | <0.001/<0.001 | 0.394/0.974 | 0.273/0.734 | 0.005/0.043 |
| <i>OXTR</i> | rs2268493 | 0.399/0.857 | 0.287/0.575 | 0.749/0.981 | 0.013/0.034 | 0.045/0.230 | 0.100/0.528 | 0.035/0.079 | 0.400/0.974 | 0.260/0.734 | 0.017/0.057 |
| <i>OXTR</i> | rs53576 | 0.564/0.890 | 0.224/0.575 | 0.547/0.923 | 0.015/0.034 | 0.027/0.230 | 0.175/0.528 | 0.016/0.075 | 0.711/0.990 | 0.260/0.734 | 0.002/0.041 |
| <i>FADS2</i> | rs174570 | 0.508/0.857 | 0.329/0.575 | 0.819/0.981 | 0.011/0.034 | 0.051/0.230 | 0.193/0.528 | 0.021/0.075 | 0.799/0.974 | 0.386/0.734 | 0.008/0.043 |
| <i>FADS2</i> | rs174576 | 0.743/0.912 | 0.256/0.575 | 0.911/0.981 | <0.001/<0.001 | 0.023/0.230 | 0.187/0.528 | 0.023/0.075 | 0.736/0.990 | 0.473/0.749 | 0.007/0.043 |
| <i>FADS2</i> | rs498793 | 0.668/0.890 | 0.751/0.819 | 0.429/0.827 | 0.015/0.034 | 0.041/0.230 | 0.036/0.528 | 0.054/0.104 | 0.933/0.990 | 0.181/0.734 | 0.003/0.041 |
| <i>COMT</i> | rs740603 | 0.488/0.857 | 0.588/0.756 | 0.703/0.981 | 0.012/0.034 | 0.143/0.322 | 0.349/0.628 | 0.002/0.027 | 0.905/0.990 | 0.384/0.734 | 0.010/0.045 |
| <i>COMT</i> | rs165774 | 0.983/0.983 | 0.121/0.575 | 0.895/0.981 | <0.001/<0.001 | 0.063/0.240 | 0.094/0.528 | 0.024/0.075 | 0.760/0.990 | 0.173/0.734 | 0.015/0.057 |
| <i>COMT</i> | rs174696 | 0.429/0.857 | 0.555/0.749 | 0.722/0.981 | 0.047/0.098 | 0.101/0.273 | 0.349/0.628 | 0.024/0.075 | 0.136/0.974 | 0.324/0.734 | 0.037/0.111 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; FDR, false discovery rate.

Table S2. Genotype effects on brain volume.

| Gene | SNPs | Age-adjusted/FDR | | | | |
|--------------|-----------|--------------------------|---|--|--|---|
| | | Total Gray Matter Volume | Left Hemisphere Cortical Gray Matter Volume | Right Hemisphere Cortical Gray Matter Volume | Left Hemisphere Cerebral White Matter Volume | Right Hemisphere Cerebral White Matter Volume |
| | | | | | | |
| <i>OXTR</i> | rs1042778 | 0.748/0.805 | 0.721/0.972 | 0.768/0.839 | 0.703/0.992 | 0.950/0.995 |
| <i>OXTR</i> | rs2268493 | 0.730/0.805 | 0.972/0.972 | 0.548/0.748 | 0.901/0.992 | 0.816/0.995 |
| <i>OXTR</i> | rs53576 | 0.805/0.805 | 0.821/0.972 | 0.839/0.839 | 0.992/0.992 | 0.995/0.995 |
| <i>FADS2</i> | rs174570 | 0.698/0.805 | 0.876/0.972 | 0.582/0.748 | 0.682/0.992 | 0.825/0.995 |
| <i>FADS2</i> | rs174576 | 0.613/0.805 | 0.750/0.972 | 0.513/0.748 | 0.954/0.992 | 0.675/0.995 |
| <i>FADS2</i> | rs498793 | 0.196/0.805 | 0.428/0.972 | 0.267/0.748 | 0.321/0.992 | 0.125/0.995 |
| <i>COMT</i> | rs740603 | 0.377/0.805 | 0.369/0.972 | 0.388/0.748 | 0.760/0.992 | 0.809/0.995 |
| <i>COMT</i> | rs165774 | 0.583/0.805 | 0.772/0.972 | 0.492/0.748 | 0.413/0.992 | 0.488/0.995 |
| <i>COMT</i> | rs174696 | 0.314/0.805 | 0.265/0.972 | 0.164/0.748 | 0.689/0.992 | 0.452/0.995 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; FDR, false discovery rate.

Table S3. Genotype effects on brain volume in the preterm and control groups controlling for age at scan.

| Gene | SNPs | Age-adjusted/P _{FDR} | | | | |
|--------------|-----------|-------------------------------|---|--|--|---|
| | | Total Gray Matter Volume | Left Hemisphere Cortical Gray Matter Volume | Right Hemisphere Cortical Gray Matter Volume | Left Hemisphere Cerebral White Matter Volume | Right Hemisphere Cerebral White Matter Volume |
| | | | | | | |
| <i>OXTR</i> | rs1042778 | 0.113/0.848 | 0.494/0.943 | 0.271/0.933 | 0.026/0.330 | 0.019/0.304 |
| <i>OXTR</i> | rs2268493 | 0.272/0.848 | 0.835/0.943 | 0.575/0.933 | 0.083/0.330 | 0.079/0.304 |
| <i>OXTR</i> | rs53576 | 0.151/0.848 | 0.705/0.943 | 0.284/0.933 | 0.072/0.330 | 0.064/0.304 |
| <i>FADS2</i> | rs174570 | 0.188/0.848 | 0.751/0.943 | 0.349/0.943 | 0.110/0.330 | 0.072/0.304 |
| <i>FADS2</i> | rs174576 | 0.189/0.848 | 0.632/0.943 | 0.364/0.943 | 0.109/0.330 | 0.068/0.304 |
| <i>FADS2</i> | rs498793 | 0.201/0.848 | 0.697/0.943 | 0.336/0.933 | 0.083/0.330 | 0.079/0.304 |
| <i>COMT</i> | rs740603 | 0.332/0.848 | 0.908/0.943 | 0.476/0.933 | 0.158/0.388 | 0.140/0.378 |
| <i>COMT</i> | rs165774 | 0.073/0.848 | 0.362/0.943 | 0.135/0.933 | 0.078/0.330 | 0.068/0.304 |
| <i>COMT</i> | rs174696 | 0.323/0.848 | 0.898/0.943 | 0.466/0.933 | 0.089/0.330 | 0.090/0.304 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; FDR, false discovery rate.

Table S4. Genotype effects on brain thickness.

| Gene | SNPs | Age-adjusted/FDR | | | | | | | | | |
|--------------|-----------|-----------------------|----------------------|-----------------|---------------------|-------------------|-----------------------|----------------------|-----------------|---------------------|-------------------|
| | | Left Hemisphere | | | | | Right Hemisphere | | | | |
| | | Lateral Orbitofrontal | Medial Orbitofrontal | Parahippocampal | Posterior Cingulate | Superior Temporal | Lateral Orbitofrontal | Medial Orbitofrontal | Parahippocampal | Posterior Cingulate | Superior Temporal |
| <i>OXTR</i> | rs1042778 | 0.210/0.962 | 0.031/0.155 | 0.296/0.920 | 0.371/0.669 | 0.113/0.917 | 0.253/0.885 | 0.869/0.869 | 0.497/0.688 | 0.682/0.682 | 0.044/0.440 |
| <i>OXTR</i> | rs2268493 | 0.855/0.962 | 0.989/0.989 | 0.368/0.920 | 0.468/0.669 | 0.751/0.917 | 0.826/0.885 | 0.222/0.740 | 0.529/0.688 | 0.299/0.682 | 0.315/0.525 |
| <i>OXTR</i> | rs53576 | 0.996/0.996 | 0.512/0.853 | 0.332/0.920 | 0.343/0.669 | 0.569/0.917 | 0.885/0.885 | 0.456/0.869 | 0.799/0.888 | 0.302/0.682 | 0.957/0.957 |
| <i>FADS2</i> | rs174570 | 0.851/0.962 | 0.839/0.989 | 0.789/0.957 | 0.920/0.920 | 0.558/0.917 | 0.749/0.885 | 0.832/0.869 | 0.095/0.605 | 0.575/0.682 | 0.296/0.525 |
| <i>FADS2</i> | rs174576 | 0.610/0.962 | 0.471/0.853 | 0.697/0.957 | 0.764/0.849 | 0.287/0.917 | 0.787/0.885 | 0.768/0.869 | 0.121/0.605 | 0.540/0.682 | 0.215/0.525 |
| <i>FADS2</i> | rs498793 | 0.491/0.962 | 0.932/0.989 | 0.663/0.957 | 0.310/0.669 | 0.780/0.917 | 0.411/0.885 | 0.681/0.869 | 0.499/0.688 | 0.469/0.682 | 0.248/0.525 |
| <i>AP0E</i> | rs405509 | 0.833/0.962 | 0.958/0.989 | 0.171/0.920 | 0.055/0.550 | 0.536/0.917 | 0.441/0.885 | 0.704/0.869 | 0.550/0.688 | 0.063/0.630 | 0.857/0.952 |
| <i>COMT</i> | rs740603 | 0.341/0.962 | 0.380/0.853 | 0.979/0.979 | 0.609/0.761 | 0.903/0.917 | 0.482/0.885 | 0.106/0.555 | 0.266/0.688 | 0.269/0.682 | 0.416/0.594 |
| <i>COMT</i> | rs165774 | 0.682/0.962 | 0.463/0.853 | 0.861/0.957 | 0.444/0.669 | 0.917/0.917 | 0.831/0.885 | 0.427/0.869 | 0.371/0.688 | 0.675/0.682 | 0.787/0.952 |
| <i>COMT</i> | rs174696 | 0.055/0.962 | 0.031/0.155 | 0.723/0.957 | 0.117/0.585 | 0.521/0.917 | 0.041/0.410 | 0.111/0.555 | 0.940/0.940 | 0.420/0.682 | 0.146/0.525 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; FDR, false discovery rate.

Table S5. Genotype effects on brain curvature in the preterm and control groups controlling for age at scan.

| Gene | SNPs | Age-adjusted/FDR | | | | | | | | | |
|--------------|-----------|-----------------------------|----------------------------|-----------------------|---------------------------|-------------------------|-----------------------------|----------------------------|-----------------------|---------------------------|-------------------------|
| | | Left Hemisphere | | | | | Right Hemisphere | | | | |
| | | Lateral Orbitofrontal Gyrus | Medial Orbitofrontal Gyrus | Parahippocampal Gyrus | Posterior Cingulate Gyrus | Superior Temporal Gyrus | Lateral Orbitofrontal Gyrus | Medial Orbitofrontal Gyrus | Parahippocampal Gyrus | Posterior Cingulate Gyrus | Superior Temporal Gyrus |
| <i>OXTR</i> | rs1042778 | 0.259/0.957 | 0.044/0.531 | 0.276/0.827 | 0.387/0.992 | 0.112/0.833 | 0.317/0.914 | 0.980/0.981 | 0.644/0.820 | 0.788/0.851 | 0.070/0.545 |
| <i>OXTR</i> | rs2268493 | 0.990/0.994 | 0.581/0.977 | 0.062/0.698 | 0.350/0.992 | 0.270/0.833 | 0.880/0.968 | 0.911/0.981 | 0.432/0.807 | 0.295/0.556 | 0.456/0.663 |
| <i>OXTR</i> | rs53576 | 0.427/0.957 | 0.712/0.977 | 0.139/0.698 | 0.948/0.992 | 0.676/0.879 | 0.417/0.914 | 0.723/0.981 | 0.296/0.807 | 0.303/0.556 | 0.150/0.545 |
| <i>FADS2</i> | rs174570 | 0.695/0.994 | 0.673/0.977 | 0.409/0.893 | 0.961/0.992 | 0.520/0.877 | 0.486/0.914 | 0.941/0.981 | 0.482/0.807 | 0.412/0.654 | 0.198/0.545 |
| <i>FADS2</i> | rs174576 | 0.494/0.957 | 0.881/0.977 | 0.562/0.972 | 0.992/0.992 | 0.906/0.986 | 0.385/0.914 | 0.871/0.981 | 0.614/0.820 | 0.615/0.751 | 0.232/0.545 |
| <i>FADS2</i> | rs498793 | 0.994/0.994 | 0.631/0.977 | 0.329/0.827 | 0.694/0.992 | 0.528/0.877 | 0.968/0.968 | 0.959/0.981 | 0.408/0.807 | 0.438/0.657 | 0.241/0.545 |
| <i>COMT</i> | rs740603 | 0.906/0.994 | 0.453/0.977 | 0.302/0.827 | 0.888/0.992 | 0.395/0.833 | 0.491/0.914 | 0.789/0.981 | 0.368/0.807 | 0.223/0.556 | 0.263/0.545 |
| <i>COMT</i> | rs165774 | 0.601/0.994 | 0.882/0.977 | 0.648/0.972 | 0.822/0.992 | 0.986/0.986 | 0.338/0.914 | 0.639/0.981 | 0.546/0.819 | 0.513/0.693 | 0.182/0.545 |
| <i>COMT</i> | rs174696 | 0.897/0.994 | 0.327/0.977 | 0.273/0.827 | 0.724/0.992 | 0.313/0.833 | 0.876/0.968 | 0.877/0.981 | 0.458/0.807 | 0.103/0.556 | 0.220/0.545 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; FDR, false discovery rate.

Table S6. Significance of minor allele frequencies of SNPs and GA.

| | | Early Preterm (n = 9) | Late Preterm (n = 11) | Control (n = 6) | Pearson χ^2 |
|--------------|-----------|--------------------------|--------------------------|--------------------|------------------|
| <i>OXTR</i> | rs1042778 | 0 | 1 | 1 | 0.409 |
| <i>OXTR</i> | rs2268493 | 3 | 3 | 0 | 0.571 |
| <i>OXTR</i> | rs53576 | 5 | 7 | 3 | 0.650 |
| <i>FADS2</i> | rs174570 | 5 | 7 | 4 | 0.511 |
| <i>FADS2</i> | rs174576 | 5 | 7 | 5 | 0.569 |
| <i>FADS2</i> | rs498793 | 5 | 1 | 0 | 0.102 |
| <i>COMT</i> | rs740603 | 6 | 8 | 3 | 0.729 |
| <i>COMT</i> | rs165774 | 2 | 3 | 1 | 0.985 |
| <i>COMT</i> | rs174696 | 6 | 9 | 3 | 0.165 |

SNP, single-nucleotide polymorphism; *OXTR*, oxytocin receptor; *FADS2*, fatty acid desaturase 2; *COMT*, catechol-o-methyltransferase; GA, gestational age.

Table S7. The sex differences of cerebral development.

| Characteristics | Male (<i>n</i> = 15) | Female (<i>n</i> = 11) | <i>p</i> -Value |
|---|--------------------------|----------------------------|-----------------|
| Volume | | | |
| Total gray matter volume | 107825.85 ± 13431.40 | 106143.82 ± 16315.27 | 0.776 |
| Left hemisphere cortical gray matter volume | 36660.81 ± 4637.06 | 36482.69 ± 6379.82 | 0.935 |
| Right hemisphere cortical gray matter volume | 36231.77 ± 4603.25 | 34957.95 ± 5693.85 | 0.534 |
| Left hemisphere cerebral white matter volume | 73300.92 ± 10143.10 | 65353.17 ± 8864.55 | 0.048 |
| Right hemisphere cerebral white matter volume | 69638.25 ± 7685.66 | 63059.96 ± 8244.22 | 0.047 |
| Thickness | | | |
| Left lateral orbitofrontal gyrus | 1.08 ± 0.14 | 1.18 ± 0.23 | 0.209 |
| Right lateral orbitofrontal gyrus | 1.07 ± 0.16 | 1.09 ± 0.17 | 0.708 |
| Left medial orbitofrontal gyrus | 1.13 ± 0.12 | 1.19 ± 0.19 | 0.371 |
| Right medial orbitofrontal gyrus | 1.18 ± 0.11 | 1.20 ± 0.23 | 0.749 |
| Left parahippocampal gyrus | 1.05 ± 0.16 | 1.05 ± 0.17 | 0.979 |
| Right parahippocampal gyrus | 1.05 ± 0.14 | 1.01 ± 0.27 | 0.671 |
| Left posterior cingulate gyrus | 1.33 ± 0.13 | 1.33 ± 0.15 | 0.909 |
| Right posterior cingulate gyrus | 1.32 ± 0.13 | 1.37 ± 0.10 | 0.248 |
| Left superior temporal gyrus | 1.40 ± 0.11 | 1.41 ± 0.19 | 0.923 |
| Right superior temporal gyrus | 1.42 ± 0.11 | 1.40 ± 0.21 | 0.814 |
| Curvature | | | |
| Left lateral orbitofrontal gyrus | 1.95 ± 0.57 | 2.08 ± 0.68 | 0.595 |
| Right lateral orbitofrontal gyrus | 2.11 ± 0.59 | 2.10 ± 0.68 | 0.962 |
| Left medial orbitofrontal gyrus | 1.56 ± 0.41 | 1.69 ± 0.62 | 0.531 |
| Right medial orbitofrontal gyrus | 1.68 ± 0.56 | 1.49 ± 0.46 | 0.367 |
| Left parahippocampal gyrus | 0.50 ± 0.29 | 0.62 ± 0.20 | 0.267 |
| Right parahippocampal gyrus | 0.54 ± 0.44 | 0.35 ± 0.24 | 0.204 |
| Left posterior cingulate gyrus | 0.92 ± 0.44 | 0.74 ± 0.27 | 0.220 |
| Right posterior cingulate gyrus | 0.90 ± 0.28 | 0.86 ± 0.41 | 0.753 |
| Left superior temporal gyrus | 5.27 ± 0.99 | 4.87 ± 0.80 | 0.284 |
| Right superior temporal gyrus | 4.53 ± 0.99 | 4.38 ± 0.88 | 0.698 |