Table S1. Bayesian model estimates for the effect of treatment on post-hatch day 40 song characteristics in juvenile zebra finches

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
|  |  |  |  |  |  |
| **Minimum Frequency** | 395 | 53.58 | 292.2 | 393.9 | 503.8 |
| Treatment effect | 37.51 | 25.19 | -14.4 | 38.43 | 84.72 |
| Nest effect (standard deviation) | 63.53 | 23.09 | 9.821 | 66.46 | 97.81 |
|  |  |  |  |  |  |
| **Maximum Frequency** | 11970 | 67.74 | 11840 | 11970 | 12100 |
| Treatment effect | -258 | 31.62 | -320.3 | -258 | -196.1 |
| Nest effect (standard deviation) | 99.86 | 0.1413 | 99.48 | 99.9 | 100 |
|  |  |  |  |  |  |
| **Percentage of fully developed syllables** | -0.4073 | 2.79 | -5.952 | -0.4062 | 5.136 |
| Treatment effect | 1.379 | 1.253 | -1.148 | 1.397 | 3.821 |
| Nest effect (standard deviation) | 2.062 | 1.459 | 0.1035 | 1.822 | 5.514 |

Table S2. Bayesian model estimates for the effect of treatment on the similarity of post-hatch day 60 song characteristics to crystallized song characteristics (PHD 100) in juvenile zebra finches.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
|  |  |  |  |  |  |
| **% Similarity**  | 55.03 | 10.45 | 34.27 | 55.09 | 75.65 |
| Treatment effect | 2.978 | 4.881 | -6.582 | 2.913 | 12.85 |
| Nest effect (standard deviation) | 16.94 | 5.533 | 7.355 | 16.39 | 29.52 |
|  |  |  |  |  |  |
| **% Accuracy**  | 69.33 | 1.551 | 66.31 | 69.31 | 72.46 |
| Treatment effect | 0.9008 | 0.6675 | -0.4588 | 0.9125 | 2.19 |
| Nest effect (standard deviation) | 1.144 | 0.8806 | 0.05243 | 0.9623 | 3.275 |
|  |  |  |  |  |  |
| **% Sequential similarity** | 54.21 | 7.763 | 38.56 | 54.28 | 69.52 |
| Treatment effect | 3.471 | 3.549 | -3.453 | 3.393 | 10.79 |
| Nest effect (standard deviation) | 10.05 | 5.318 | 0.9707 | 9.852 | 21.41 |
|  |  |  |  |  |  |
| **Pitch difference** | 1.587 | 0.3471 | 0.8881 | 1.589 | 2.276 |
| Treatment effect | -0.054 | 0.1633 | -0.3786 | -0.05561 | 0.2745 |
|  Nest effect (standard deviation) | 0.5898 | 0.1838 | 0.2656 | 0.5716 | 1.005 |

Table S3. Bayesian model estimates for the effect of treatment on crystallized song characteristics (PHD 100 - Group 1) of juvenile zebra finches.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
|  |  |  |  |  |  |
| **Minimum frequency** | 595.2 | 53.88 | 490.1 | 594.8 | 702.3 |
| Treatment effect | 1.59 | 24.38 | -46.72 | 1.778 | 49.29 |
| Nest effect (standard deviation) | 78.11 | 15.75 | 41.1 | 80.82 | 99.02 |
|  |  |  |  |  |  |
| **Maximum frequency** | 18710 | 67.15 | 18580 | 18710 | 18840 |
| Treatment effect | -874.9 | 30.59 | -934.8 | -874.9 | -814.7 |
| Nest effect (standard deviation) | 99.94 | 0.05958 | 99.78 | 99.96 | 100 |
|  |  |  |  |  |  |
| **Peak frequency** | 4475.0 | 67.06 | 4344.0 | 4475.0 | 4607.0 |
| Treatment effect | -69.81 | 30.49 | -129.5 | -69.79 | -9.972 |
| Nest effect (standard deviation) | 99.65 | 0.3514 | 98.7 | 99.76 | 99.99 |
|  |  |  |  |  |  |
| **Complexity (# notes)** | 5.593 | 1.028 | 3.491 | 5.613 | 7.575 |
| Treatment effect | -0.3364 | 0.4455 | -1.218 | -0.3383 | 0.5603 |
| Nest effect (standard deviation) | 0.971 | 0.6597 | 0.03884 | 0.8906 | 2.48 |
|  |  |  |  |  |  |
| **Duration** | 0.8112 | 0.1601 | 0.4883 | 0.8126 | 1.126 |
| Treatment effect | -0.006857 | 0.07028 | -0.1483 | -0.00641 | 0.1319 |
| Nest effect (standard deviation) | 0.153 | 0.1021 | 0.00839 | 0.1398 | 0.3858 |
|  |  |  |  |  |  |
| **Tempo** | 6.851 | 0.7638 | 5.291 | 6.865 | 8.328 |
| Treatment effect | -0.2918 | 0.3356 | -0.9427 | -0.2979 | 0.3939 |
| Nest effect (standard deviation) | 0.7977 | 0.4811 | 0.0617 | 0.7558 | 1.87 |

Table S4. Bayesian model estimates for the effect of treatment (noise versus silent only) on crystallized song characteristics (PHD 200 - Group 2) of juvenile zebra finches.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** |  **Mean** |  **SD** | **2.50%** | **Median** | **97.50%** |
| **Minimum frequency** | 659.6 | 89.96 | 479.6 | 660 | 837.7 |
| Treatment effect | 17.79 | 53.78 | -88.58 | 17.75 | 125.6 |
| Nest effect (standard deviation) | 52.82 | 26.36 | 3.734 | 55.56 | 96.26 |
|  |  |  |  |  |  |
| **Maximum frequency** | 10520 | 123.2 | 10270 | 10530 | 10760 |
| Treatment effect | 120.3 | 73.33 | -17.65 | 117.7 | 271.1 |
| Nest effect (standard deviation) | 74.7 | 22.84 | 13.13 | 81.73 | 99.31 |
|  |  |  |  |  |  |
| **Peak frequency** | 4410 | 149.2 | 4117 | 4409 | 4703 |
| Treatment effect | -229.1 | 89.38 | -404.3 | -228.9 | -54.08 |
| Nest effect (standard deviation) | 99.34 | 0.6591 | 97.57 | 99.54 | 99.98 |
|  |  |  |  |  |  |
| **Complexity** | 4.284 | 1.458 | 1.395 | 4.272 | 7.204 |
| Treatment effect | 1.434 | 0.9224 | -0.402 | 1.435 | 3.261 |
| Nest effect (standard deviation) | 0.885 | 0.5592 | 0.05157 | 0.8527 | 2.134 |
|  |  |  |  |  |  |
| **Duration** | 0.8456 | 0.2577 | 0.325 | 0.8455 | 1.361 |
| Treatement effect | 0.03685 | 0.1635 | -0.2874 | 0.03664 | 0.366 |
| Nest effect (standard deviation) | 0.1526 | 0.0973 | 0.008123 | 0.1471 | 0.369 |
|  |  |  |  |  |  |
| **Tempo** | 5.476 | 1.083 | 3.31 | 5.473 | 7.639 |
| Treatment effect | 0.1232 | 0.6847 | -1.25 | 0.1248 | 1.496 |
| Nest effect (standard deviation) | 0.6511 | 0.4046 | 0.03897 | 0.6261 | 1.561 |

Table S5. Bayesian model estimates for the effect of treatment on baseline circulating corticosterone in juvenile zebra finches

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
| Cort | 3.19 | 0.5731 | 2.056 | 3.191 | 4.334 |
| Treatment effect | 0.0612 | 0.2512 | -0.4485 | 0.06455 | 0.5512 |
| Nest effect (standard deviation) | 0.5276 | 0.3432 | 0.02867 | 0.4892 | 1.306 |

Table S6. Bayesian model estimates for the effect of treatment on brain structure volumes (relative to total brain size) of juvenile (~PHD100; group 1) zebra finches.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
| **RA volume** | 0.215 | 0.007445 | 0.2003 | 0.215 | 0.2297 |
| Treatment effect | -0.001047 | 0.007268 | -0.01531 | -0.001053 | 0.01336 |
| Total brain volume effect | -2.43E-04 | 5.05E-04 | -0.001242 | -2.40E-04 | 7.55E-04 |
| No. brothers effect | -5.32E-04 | 0.008174 | -0.01678 | -4.88E-04 | 0.01559 |
|  |  |  |  |  |  |
| **HVC volume** | 0.2853 | 0.01209 | 0.2615 | 0.2853 | 0.3092 |
| Treatment effect | -0.03381 | 0.01182 | -0.05713 | -0.03383 | -0.01039 |
| Total brain volume effect | -6.09E-04 | 8.20E-04 | -0.002227 | -6.07E-04 | 0.001012 |
| No. brothers effect | 0.03551 | 0.01327 | 0.009179 | 0.03555 | 0.06175 |
|  |  |  |  |  |  |
| **Area X volume** | 1.09 | 0.0621 | 0.9678 | 1.09 | 1.213 |
| Treatment effect | -0.1101 | 0.06448 | -0.2372 | -0.1101 | 0.01743 |
| Total brain volume effect | -0.002055 | 0.004411 | -0.01077 | -0.002035 | 0.006652 |
| No. brothers effect | 0.1742 | 0.07402 | 0.02698 | 0.1746 | 0.3204 |

Table S7a. DIC comparison table for Bayesian models predicting song similarity to tutor.

|  |  |  |
| --- | --- | --- |
|  | MODEL | DIC |
| **% Similarit**y |  |  |
|  | Treatment & Brothers | 220.643 |
|  | Treatment & Total brain size & Brothers | 224.199 |
|  | Treatment & HVC & Brothers | 222.903 |
|  | Treatment & RA & Brothers | 223.15 |
|  | Treatment & Area X & Brothers | 217.225 |
|  | Treatment & HVC & Area X & Brothers | 223.017 |
|  | Treatment & RA & Area X & Brothers | 223.017 |
|  | Treatment & HVC & RA & Brothers | 223.835 |
|  | Treatment & HVC & RA & Area X & Brothers | 219.782 |
|  |  |  |
| **Accuracy** |  |  |
|  | Treatment & Brothers | 198.639 |
|  | Treatment & Total brain size & Brothers | 203.25 |
|  | Treatment & HVC & Brothers | 203.006 |
|  | Treatment & RA & Brothers | 203.152 |
|  | Treatment & Area X & Brothers | 196.356 |
|  | Treatment & HVC & Area X & Brothers | 204.951 |
|  | Treatment & RA & Area X & Brothers | 204.951 |
|  | Treatment & HVC & RA & Brothers | 203.843 |
|  | Treatment & HVC & RA & Area X & Brothers | 198.172 |
|  |  |  |
| **% Sequential** |  |  |
|  | Treatment & Brothers | 223.039 |
|  | Treatment & Total brain size & Brothers | 229.626 |
|  | Treatment & HVC & Brothers | 229.286 |
|  | Treatment & RA & Brothers | 229.217 |
|  | Treatment & Area X & Brothers | 219.638 |
|  | Treatment & HVC & Area X & Brothers | 228.275 |
|  | Treatment & RA & Area X & Brothers | 228.275 |
|  | Treatment & HVC & RA & Brothers | 229.961 |
|  | Treatment & HVC & RA & Area X & Brothers | 222.311 |

Table S7b. Bayesian model estimates for the models with lowest DIC score in the comparison for predicting similarity to tutor song.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
| **Sequential similarity** | 83.11 | 7.658 | 68.01 | 83.09 | 98.3 |
| Treatment effect | -7.366 | 5.765 | -18.75 | -7.375 | 4.13 |
| No. brothers effect | 3.507 | 6.642 | -9.637 | 3.518 | 16.61 |
| Treatment\*brother interaction | -6.87 | 4.828 | -16.49 | -6.876 | 2.666 |
| Area X Volume effect | -28.24 | 23.45 | -74.86 | -28.35 | 18.19 |
| Area X Volume\*brother interaction | 19.07 | 33.08 | -46.98 | 19.21 | 84.45 |
| Area X\* Treatment interaction | -11.92 | 35.89 | -82.94 | -11.98 | 59.47 |
|  |  |  |  |  |  |
| **Accuracy** | 73.85 | 4.618 | 64.74 | 73.84 | 83.01 |
| Treatment effect | -1.791 | 3.475 | -8.651 | -1.797 | 5.139 |
| No. brothers effect | -2.779 | 4.004 | -10.7 | -2.773 | 5.123 |
| Treatment\*brother interaction | -6.664 | 2.911 | -12.46 | -6.668 | -0.9155 |
| Area X Volume effect | 4.01 | 14.14 | -24.1 | 3.944 | 32 |
| Area X Volume\*brother interaction | -0.2575 | 19.96 | -40.11 | -0.177 | 39.18 |
| Area X\* Treatment interaction | 1.557 | 21.65 | -41.3 | 1.52 | 44.62 |
|  |  |  |  |  |  |
| **Similarity** | 61.9 | 7.267 | 47.56 | 61.88 | 76.31 |
| Treatment effect | -2.103 | 5.47 | -12.9 | -2.112 | 8.804 |
| No. brothers effect | -6.241 | 6.303 | -18.71 | -6.231 | 6.197 |
| Treatment\*brother interaction | -6.169 | 4.582 | -15.3 | -6.175 | 2.879 |
| Area X Volume effect | 3.29 | 22.25 | -40.95 | 3.185 | 47.34 |
| Area X Volume\*brother interaction | -18.85 | 31.39 | -81.52 | -18.73 | 43.2 |
| Area X\* Treatment interaction | 11.3 | 34.06 | -56.12 | 11.25 | 79.03 |

Table S8. Bayesian model estimates for the effect of treatment on song similarity to tutor of juvenile (~PHD200; group 2) zebra finches.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  **Node** | **Mean** | **SD** | **2.50%** | **Median** | **97.50%** |
| % Similarity | 67.34 | 24.84 | 18.18 | 67.11 | 117.1 |
| Treatment effect | 0.7418 | 15.71 | -30.81 | 0.8696 | 31.77 |
| Nest effect (standard deviation) | 14.78 | 9.397 | 0.7103 | 14.27 | 35.8 |
|  |  |  |  |  |  |
| Accuracy | 73.81 | 5.213 | 63.49 | 73.84 | 84.13 |
| Treatment effect | 3.453 | 3.306 | -3.055 | 3.426 | 10.03 |
| Nest effect (standard deviation) | 3.049 | 1.976 | 0.1675 | 2.93 | 7.345 |
|  |  |  |  |  |  |
| % Sequential similarity | 53.45 | 10.26 | 32.84 | 53.43 | 73.79 |
| Treatment effect | 12.05 | 6.497 |  -1.055 | 12.09 | 25.07 |
| Nest effect (standard deviation) | 6.166 | 3.901 | 0.3797 | 5.911 | 14.96 |