Supplementary Material

Model Recovery

As this work represents the first application of the threshold variant of the circular diffusion model, we conducted a model-recovery exercise with the continuous and threshold diffusion models to assess the extent to which the predictions of the models might mimic each other. For each individual participant, we used the set of parameters that provided the best fit to empirical data for both the continuous and threshold models for that participant to generate a set of simulated data for each of the models. As noted in the main text, there was considerable variability between participants in how they responded to the task, particularly in terms of response accuracy in the source retrieval task. We excluded the data from participants 1, 9, 13, 15, and 17 from this exercise because these participants had source accuracy distributions that were at or near uniformity, and so simulated data based on these participants would not be useful in assessing the diagnosticity of the models. As a result, we generated two datasets consisting of 14 simulated participants, one generated by the continuous model and one generated by the threshold model. Each simulated dataset contained the same number of observations as the empirical dataset it was based on. We then fit each of the models to both sets of simulated data, using BIC as the fit statistic. Table 1 shows a comparison of BIC values between the fits of the continuous and threshold models when the continuous model generated the data, and the same comparison when the threshold model generated the data.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 1  Bayesian Information Criterion (BIC) fits to Simulated Data | | | | |
| Participant | Continuous Generated | | Threshold Generated | |
| Continuous | Threshold | Continuous | Threshold |
| 2 | **2312.59** | 2331.05 | 2379.57 | **1938.61** |
| 3 | **2079.81** | 2090.49 | 1993.61 | **1855.88** |
| 4 | **3913.93** | 3922.41 | 4326.16 | **3563.50** |
| 5 | **2241.32** | 2247.76 | 2218.71 | **2001.89** |
| 6 | 2525.07 | **2488.46** | 1927.56 | **1873.88** |
| 7 | **2731.03** | 2764.22 | 1589.86 | **1361.50** |
| 8 | 1869.79 | **1768.41** | 1392.64 | **661.03** |
| 10 | **1941.70** | 2002.91 | 1812.23 | **1710.62** |
| 11 | **2115.28** | 2117.56 | 2053.44 | **1871.30** |
| 12 | **1584.48** | 1589.05 | 1766.84 | **1108.78** |
| 16 | **2022.59** | 2028.29 | 2014.49 | **1810.92** |
| 18 | **2622.23** | 2660.77 | 2171.32 | **1880.43** |
| 19 | **1815.31** | 1834.43 | 1793.18 | **1736.55** |
| 20 | **1731.86** | 1757.52 | 1773.91 | **1751.25** |

These comparisons are summarized in Table 2, which is a contingency table based on which model was used to generate the data, and which model was used to subsequently fit the simulated data. The correct model was successfully recovered in all cases when the threshold model was used to generate the data, and in almost all cases when the continuous model was used to generate the data. This model recovery exercise demonstrates that the continuous and threshold models make distinct predictions, and so supports the diagnosticity of our model-fitting results presented in the main text.

|  |  |  |  |
| --- | --- | --- | --- |
| Table 2  Model Recovery Contingency Table | | | |
|  |  | Generating Model | |
|  |  | Continuous | Threshold |
| Fitting Model | Continuous | 12 | 0 |
|  | Threshold | 2 | 14 |

Mixture Model Fits

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | High Imageability | | | | | | Low Imageability | | | | | |
|  | High Confidence | | Low Confidence | | Unrecognized | | High Confidence | | Low Confidence | | Unrecognized | |
| Participant | κ | *π* | κ | *π* | κ | *π* | κ | *π* | κ | *π* | κ | *π* |
| 1 | 0.25 | 1.00 | 8.06 | 0.15 | 201.20 | 0.02 | 221.44 | 0.06 | 1.95 | 0.65 | 10.46 | 0.01 |
| 2 | 17.52 | 0.76 | 0.00 | 0.00 | 1.19 | 0.51 | 23.42 | 0.70 | 87.12 | 0.24 | 0.00 | 0.00 |
| 3 | 9.97 | 0.58 | 27.39 | 0.13 | 10.64 | 0.24 | 12.11 | 0.48 | 1.01 | 0.59 | 250.00 | 0.05 |
| 4 | 42.02 | 0.59 | 88.94 | 0.06 | 250.00 | 0.03 | 33.62 | 0.51 | 14.03 | 0.10 | 2.35 | 0.24 |
| 5 | 15.70 | 0.69 | 250.00 | 0.09 | 48.03 | 0.12 | 20.98 | 0.48 | 5.55 | 0.62 | 44.21 | 0.34 |
| 6 | 13.29 | 0.24 | 3.41 | 0.13 | 36.07 | 0.06 | 13.73 | 0.31 | 250.00 | 0.04 | 188.56 | 0.07 |
| 7 | 8.89 | 0.74 | 209.66 | 0.10 | 250.00 | 0.07 | 11.69 | 0.69 | 41.83 | 0.30 | 21.73 | 0.09 |
| 8 | 42.74 | 0.89 | 75.82 | 0.46 | 250.00 | 0.49 | 36.73 | 0.88 | 126.27 | 0.73 | 250.00 | 0.15 |
| 9 | 0.14 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 250.00 | 0.02 | 0.01 | 1.00 | 139.14 | 0.06 |
| 10 | 48.40 | 0.90 | 3.38 | 1.00 | 105.81 | 0.52 | 48.02 | 0.89 | 250.00 | 1.00 | 250.00 | 0.05 |
| 11 | 12.47 | 0.39 | 83.20 | 0.28 | 34.56 | 0.36 | 9.11 | 0.37 | 0.10 | 1.00 | 250.00 | 0.08 |
| 12 | 45.42 | 0.73 | 50.55 | 0.20 | 3.16 | 0.26 | 38.12 | 0.76 | 17.81 | 0.44 | 1.74 | 0.25 |
| 13 | 250.00 | 0.02 | 250.00 | 0.01 | 0.00 | 0.00 | 3.70 | 0.10 | 42.09 | 0.01 | 0.00 | 0.00 |
| 15 | 22.79 | 0.08 | 65.81 | 0.00 | 0.11 | 1.00 | 1.45 | 0.38 | 0.00 | 0.00 | 250.00 | 0.01 |
| 16 | 10.40 | 0.65 | 0.00 | 0.00 | 9.76 | 0.13 | 14.93 | 0.56 | 146.56 | 0.37 | 22.24 | 0.25 |
| 17 | 4.76 | 0.12 | 0.20 | 1.00 | 4.05 | 0.09 | 1.31 | 0.14 | 42.27 | 0.06 | 0.00 | 0.00 |
| 18 | 25.90 | 0.60 | 222.14 | 0.47 | 2.75 | 0.34 | 9.95 | 0.71 | 250.00 | 0.08 | 50.67 | 0.23 |
| 19 | 4.99 | 0.31 | 57.92 | 0.31 | 0.20 | 1.00 | 14.26 | 0.19 | 190.71 | 0.66 | 0.32 | 1.00 |
| 20 | 8.52 | 0.27 | 242.45 | 0.06 | 59.46 | 0.02 | 17.85 | 0.17 | 250.00 | 0.07 | 250.00 | 0.10 |