# The more numerous the longer: how the interaction between numerosity and time affects their cortical representation

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## Supplementary Information

## pRF modeling

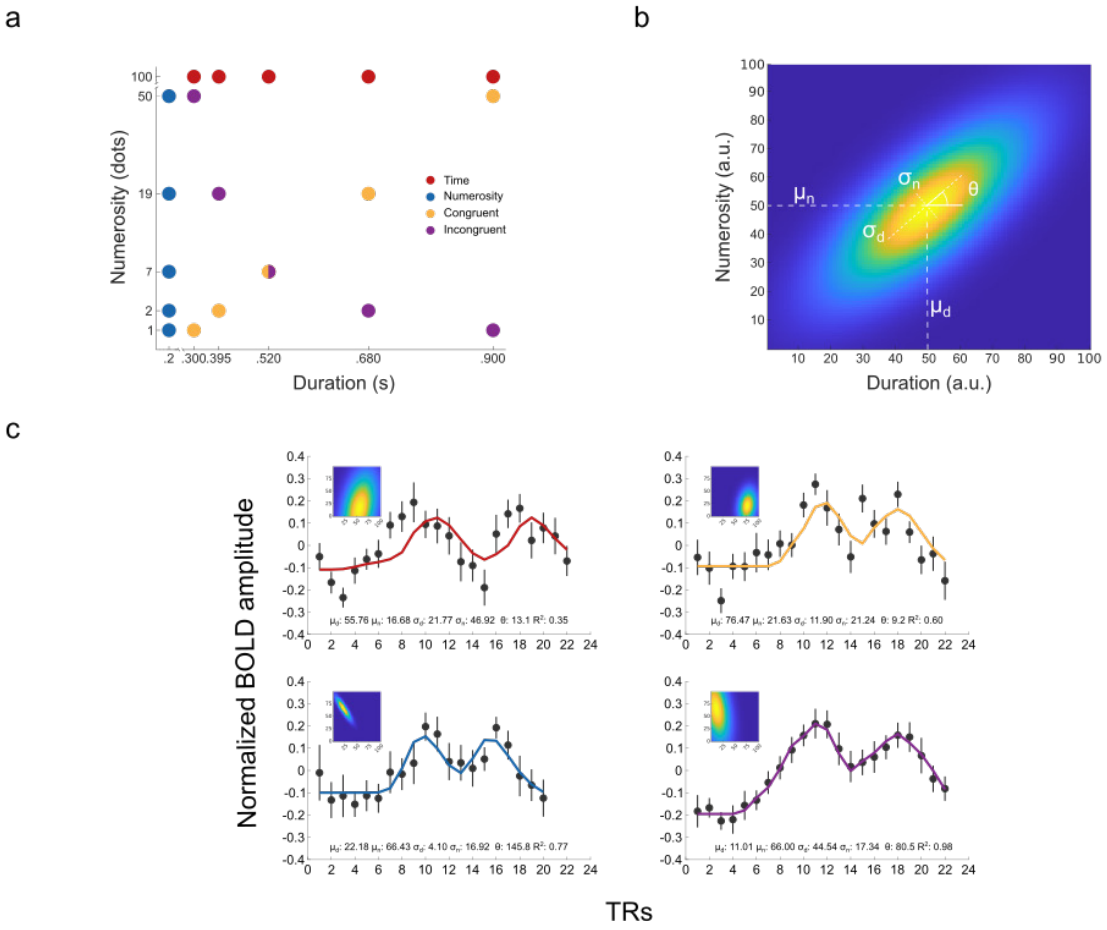


**Fig. S1 pRF Modeling** Panel a shows the stimulus space i.e., the combination of stimuli' duration and numerosity presented in each experimental condition: red is time, blue numerosity, yellow congruent and violet incongruent (see Materials and Methods – Stimuli and Procedure). An example population response function is shown in panel b: preference $\mu_d$, $\mu_{n,}$ sensitivity $\sigma_{d,}$ $\sigma_n$ and the orientation $\theta$ of the response function are displayed. Panel c shows the result of the fitting procedure (see Material and Methods – pRF Modeling). Solid lines represent the BOLD response predicted by the pRF model color-coded according to the different conditions (as in panel a) in four example vertices. Black dots represent the normalized recorded BOLD response averaged across stimuli cycles (see Material and Methods – pRF Modeling), error bars are the standard error of the mean. The insets in each panel represent the population response function, its parameters and goodness of fit are reported in each plot.

## Group Level Model Fit

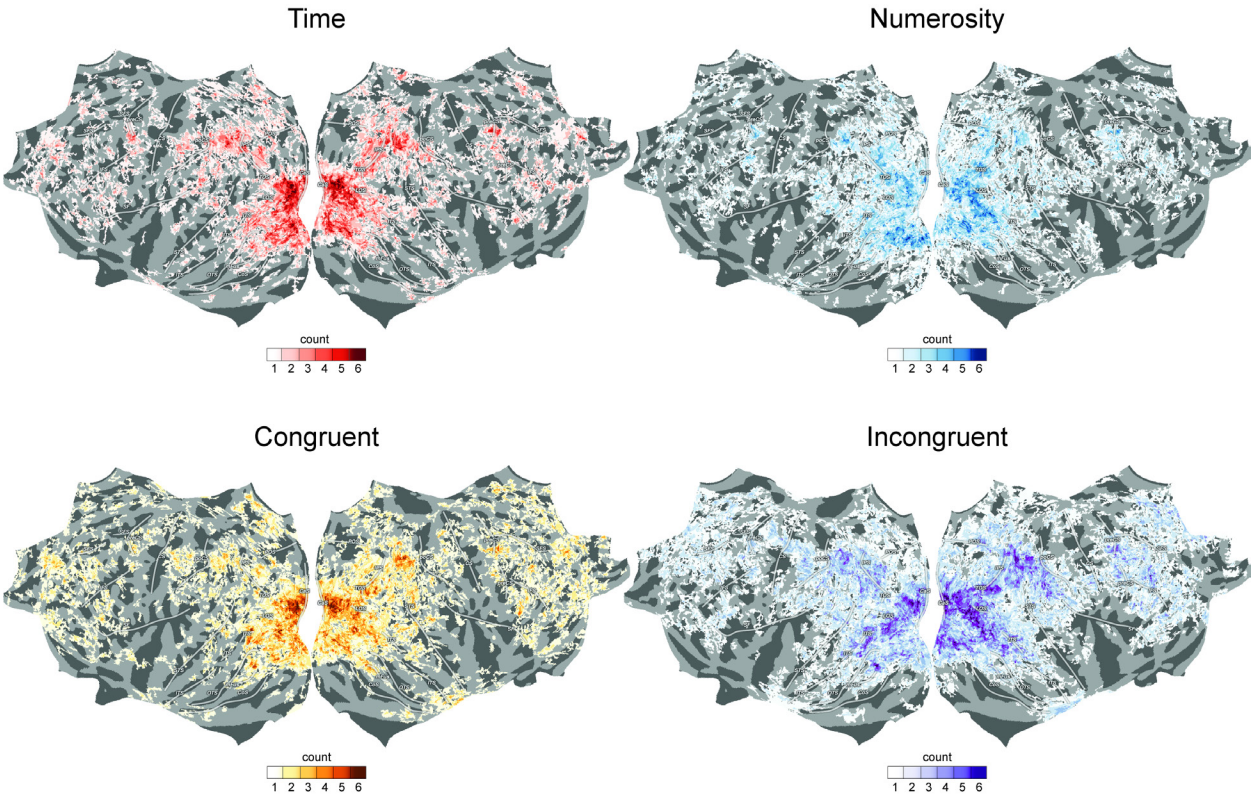


**Fig. S2 Group Level pRF results.** Group level model fit results rendered on a flatten representation of the fsaverage surface. Color-coded for each vertex is reported the number of participant showing a model fit above exclusion criteria ($R^2 > 25\%$ and $p < .01$ cluster-level corrected) from light to dark colors (red is Time, blue is Numerosity, yellow is Congruent and purple is Incongruent). Major sulci are marked by solid with lines. Legend: CaS=calcarine sulcus, LOS=lateral-occipital sulcus, POS=pareto-occipital sulcus, TOS=transverse occipital sulcus, OTS=occipito-temporal sulcus, CoS=collateral sulcus, mFus=mid-fusiform sulcus, ITS=inferior temporal sulcus, STS=superior temporal sulcus, IPS=intra-parietal sulcus, poCS=post-central sulcus, SF=sylvian fissure, CS=central sulcus, preCS=pre-central sulcus, SFS=superior-frontal sulcus, IFS=inferior-frontal sulcus.

## Duration and Numerosity Maps

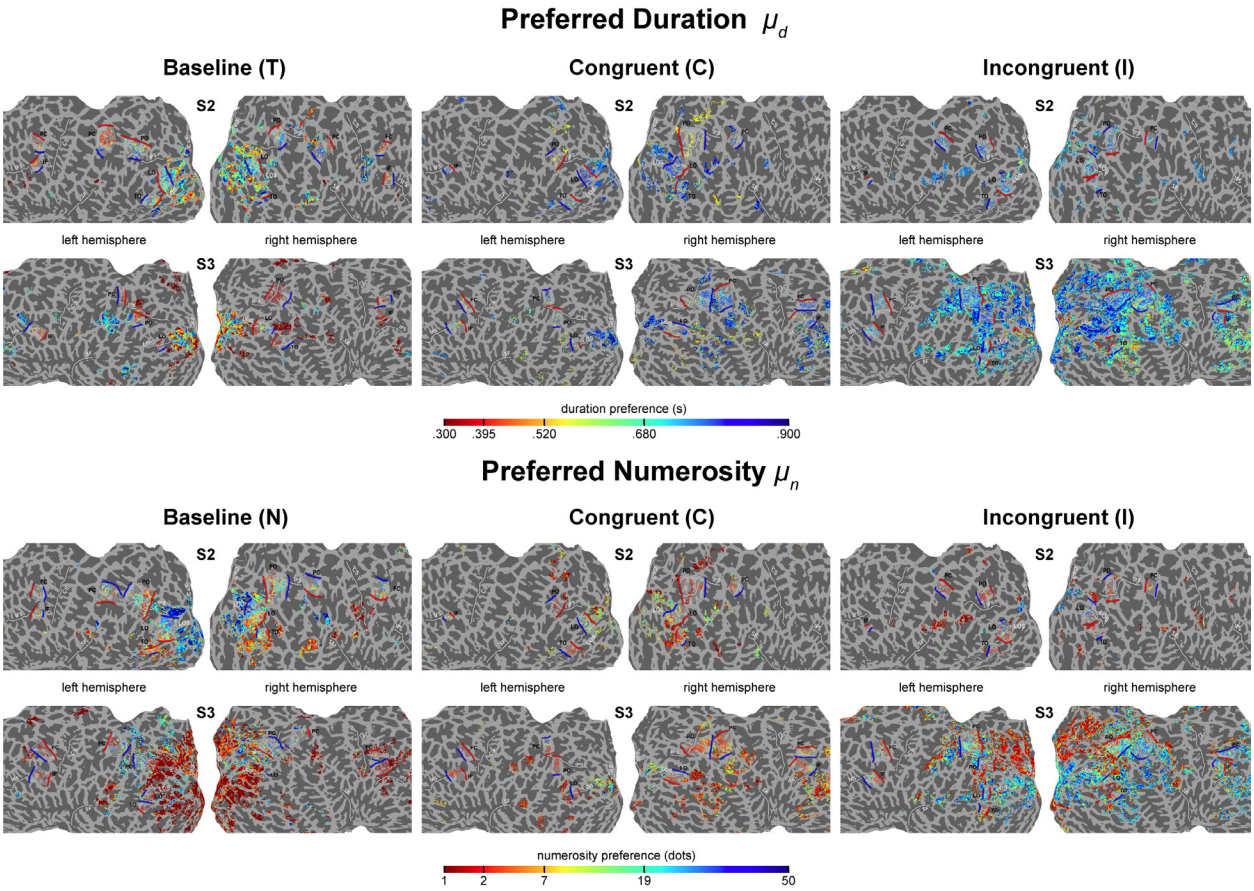


**Fig. S2 Population receptive field maps (pRF) of preferred duration and numerosity**. Caption below

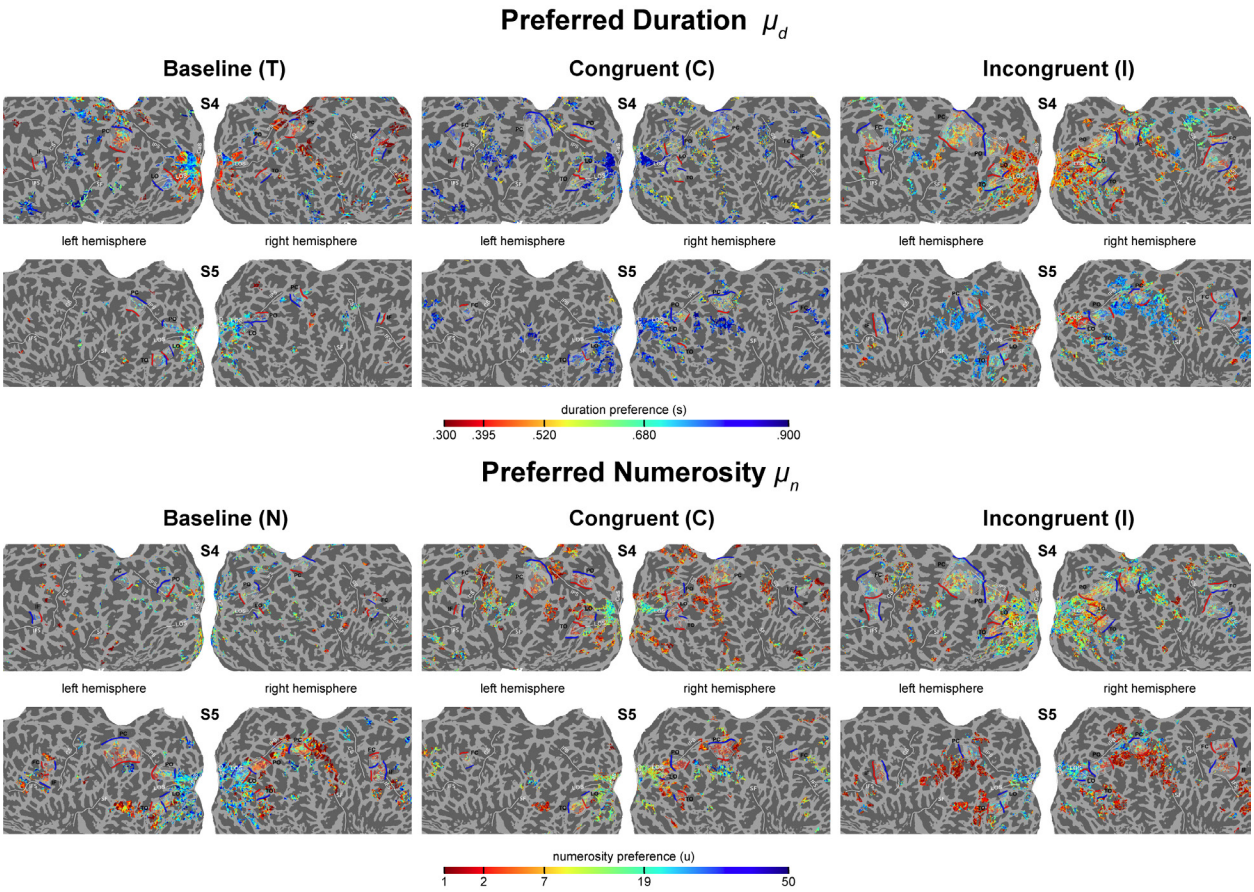


**Fig. S3 Population receptive field maps (pRF) of preferred duration and numerosity**. Distribution of preferred duration and numerosity (color-coded) in the different experimental conditions projected onto a flattened cortical surface of the participants not displayed in the main text (each vertex: $R^2 > 25\%$, $p < 0.01$ cluster-level corrected). Duration preferences and numerosity preferences are displayed in the top panel and bottom panels respectively. In different columns of the panels are the different experimental conditions. In the leftmost the two baselines Time (T) or Numerosity (N), middle the Congruent (C) condition and the Incongruent (I) condition in the rightmost. Red and blue lines refer to short/low and long/high maps' edges respectively. Map's lateral edges are indicated by white dashed lines. Solid white lines mark principal sulci. Legend: LO=lateral occipital, TO=temporal-occipital, PO=parieto-occipital, PC =parietal cortex, FC=frontal cortex, IF=inferior frontal cortex. LOS=lateral occipital sulcus, IPS=intraparietal sulcus, CS =central sulcus, SF=Sylvian fissure, IFS=inferior frontal sulcus, lh= left hemisphere, rh= right hemisphere.

## Scalar Property Analysis

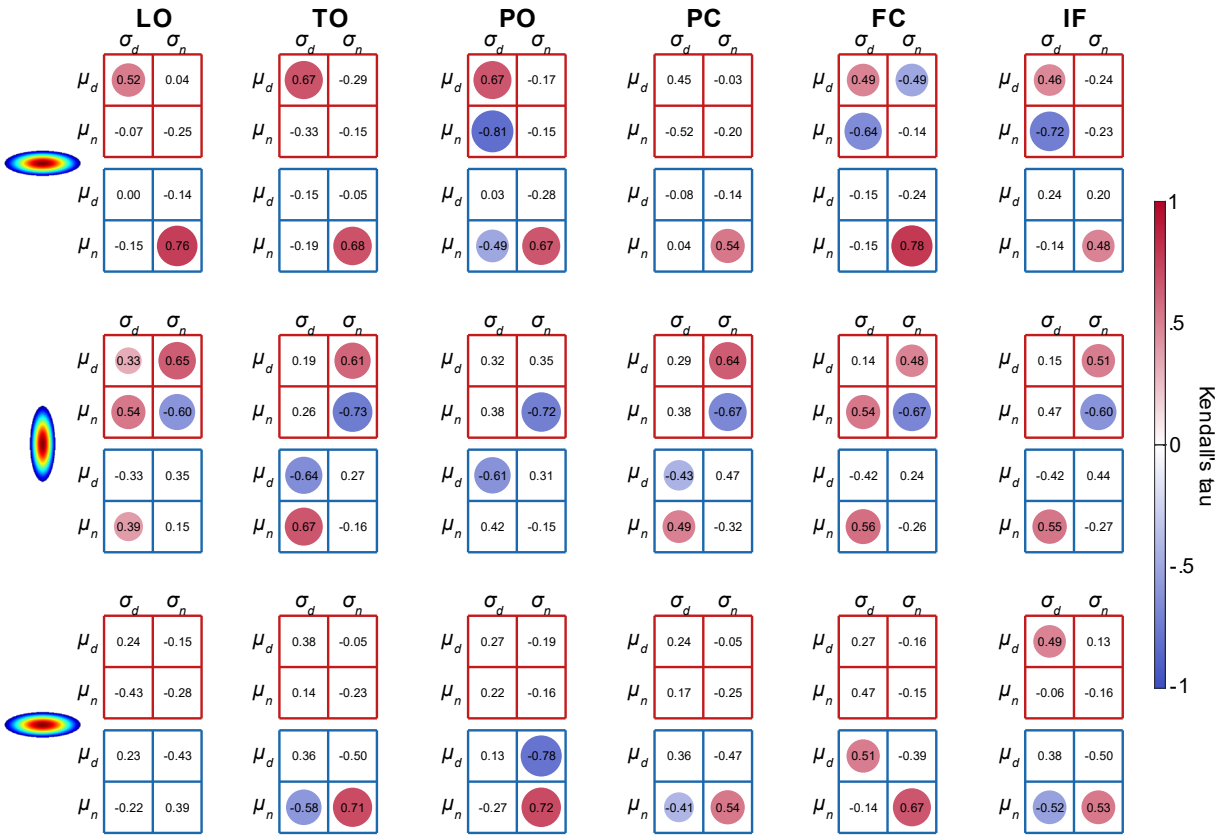


**Fig S4a Correlation between response preference and sensitivity in the baseline conditions.** Correlation plot for three groups of response function orientation, 0 in the top row, 90 in the middle and 180 degrees in the bottom. Columns represent the different ROIs. Kendall's tau correlation coefficients are displayed for each pair of response parameters μ and σ in the Time (in red ) and in the Numerosity (in blue) conditions. Circles mark the pair of parameters significantly correlated, the color and the radius of the circles represent the strength of the correlation.

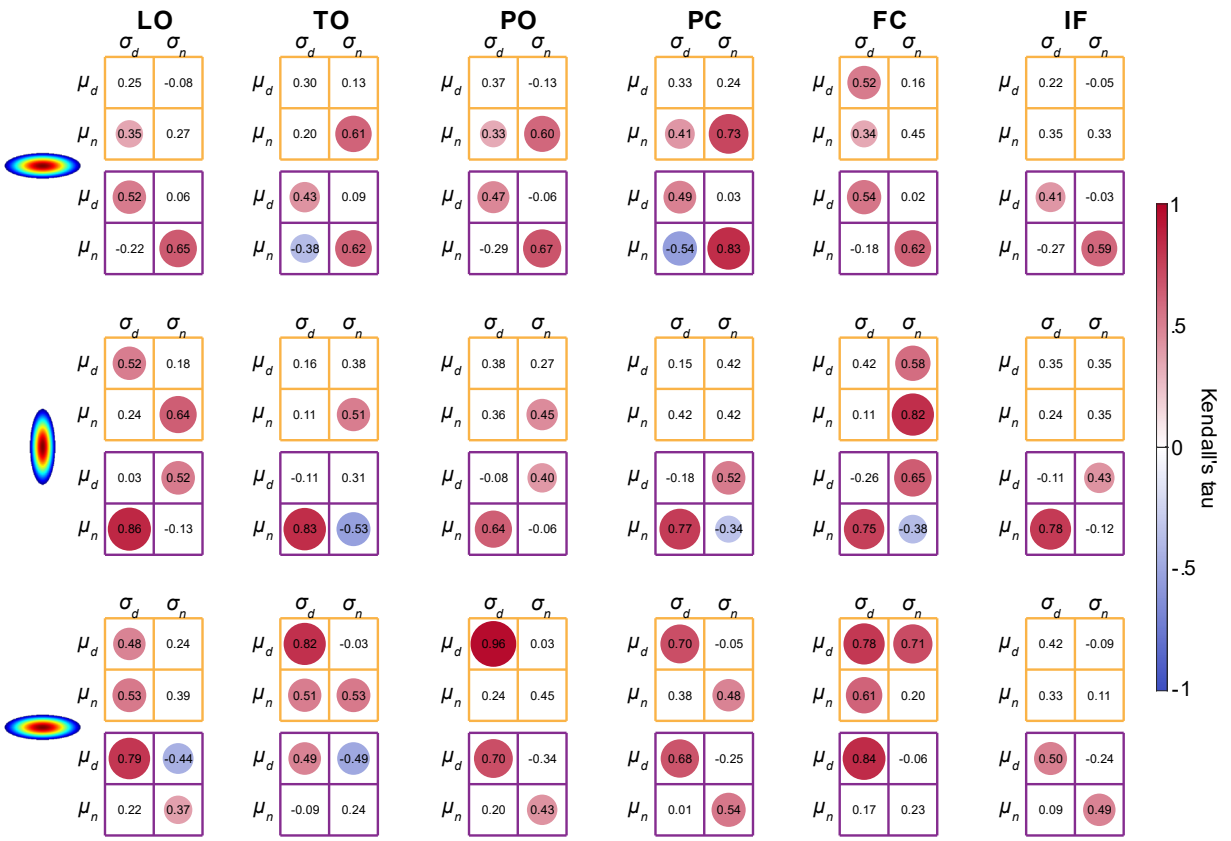


**Fig S4b Correlation between response preference and sensitivity in the experimental conditions.** Correlation plot for three groups of response function orientation, 0 in the top row, 90 in the middle and 180 degrees in the bottom. Columns represent the different ROIs. Kendall's tau correlation coefficients are displayed for each pair of response parameters μ and σ in the Congruent (in yellow) and in the Incongruent (in purple) conditions. Circles mark the pair of parameters significantly correlated, the color and the radius of the circles represent the strength of the correlation.

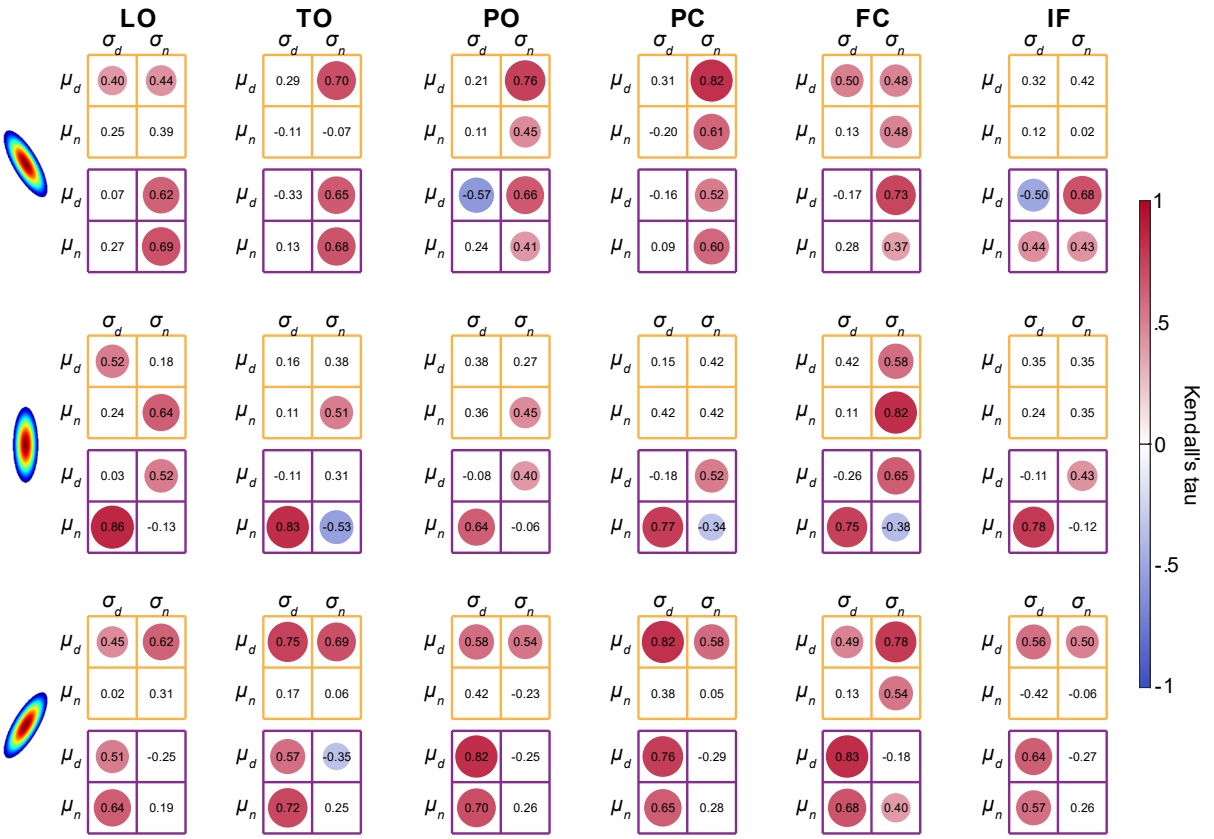


**Fig S5a Correlation between response preference and sensitivity in the experimental conditions, diagonal orientations.** Correlation plot for three groups of response function orientation, 45 in the top row, 90 in the middle (same as Figure 3b for reference) and 135 degrees in the bottom. Columns represent the different ROIs. Kendall's tau correlation coefficients are displayed for each pair of response parameters μ and σ in the Congruent ( in yellow ) and in the Incongruent ( in purple ) conditions. Circles mark the pair of parameters significantly correlated, the color and the radius of the circles represent the strength of the correlation.

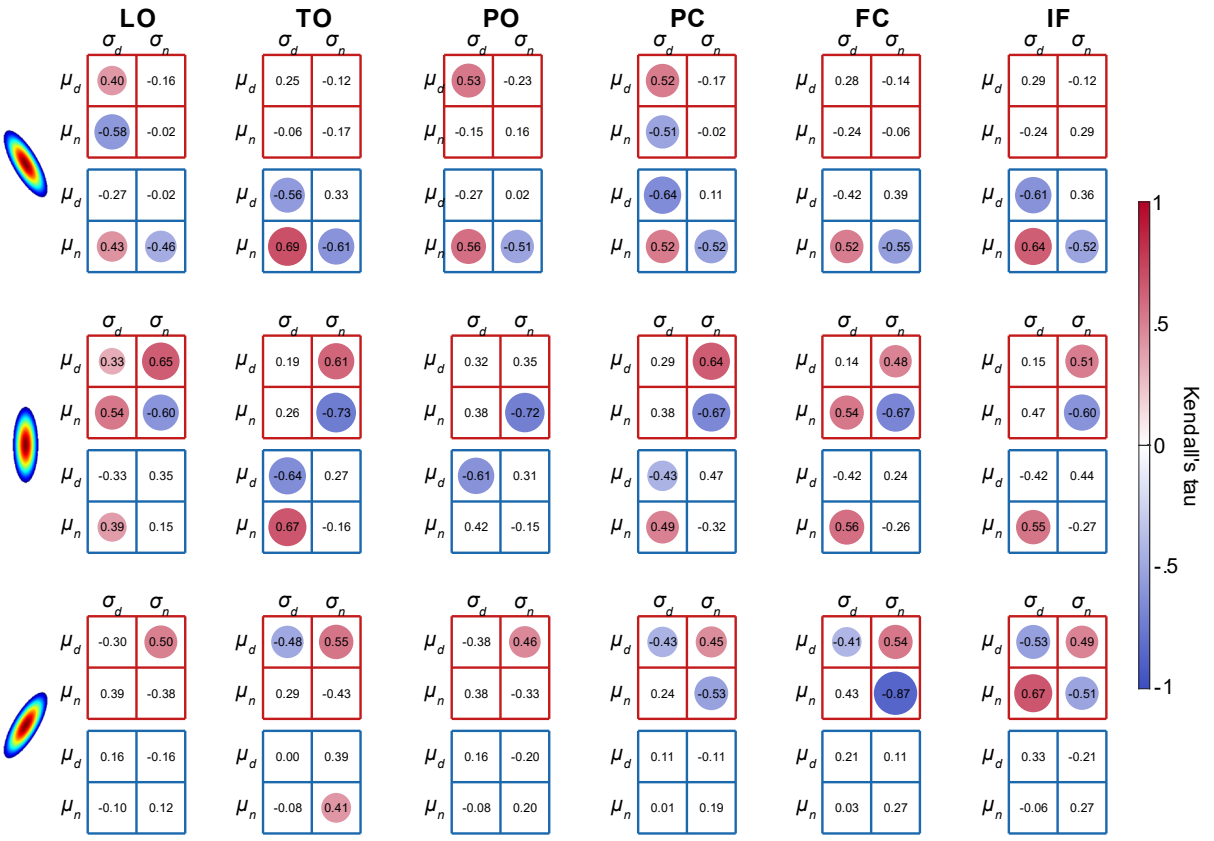


**Fig S5b Correlation between response preference and sensitivity in the baseline conditions, diagonal orientations.** Correlation plot for three groups of response function orientation, 45 in the top row, 90 in the middle (same as Figure 3a for reference) and 135 degrees in the bottom. Columns represent the different ROIs. Kendall's tau correlation coefficients are displayed for each pair of response parameters μ and σ in the Time ( in red ) and in the Numerosity ( in blue ) conditions. Circles mark the pair of parameters significantly correlated, the color and the radius of the circles represent the strength of the correlation.

## Overlap between conditions

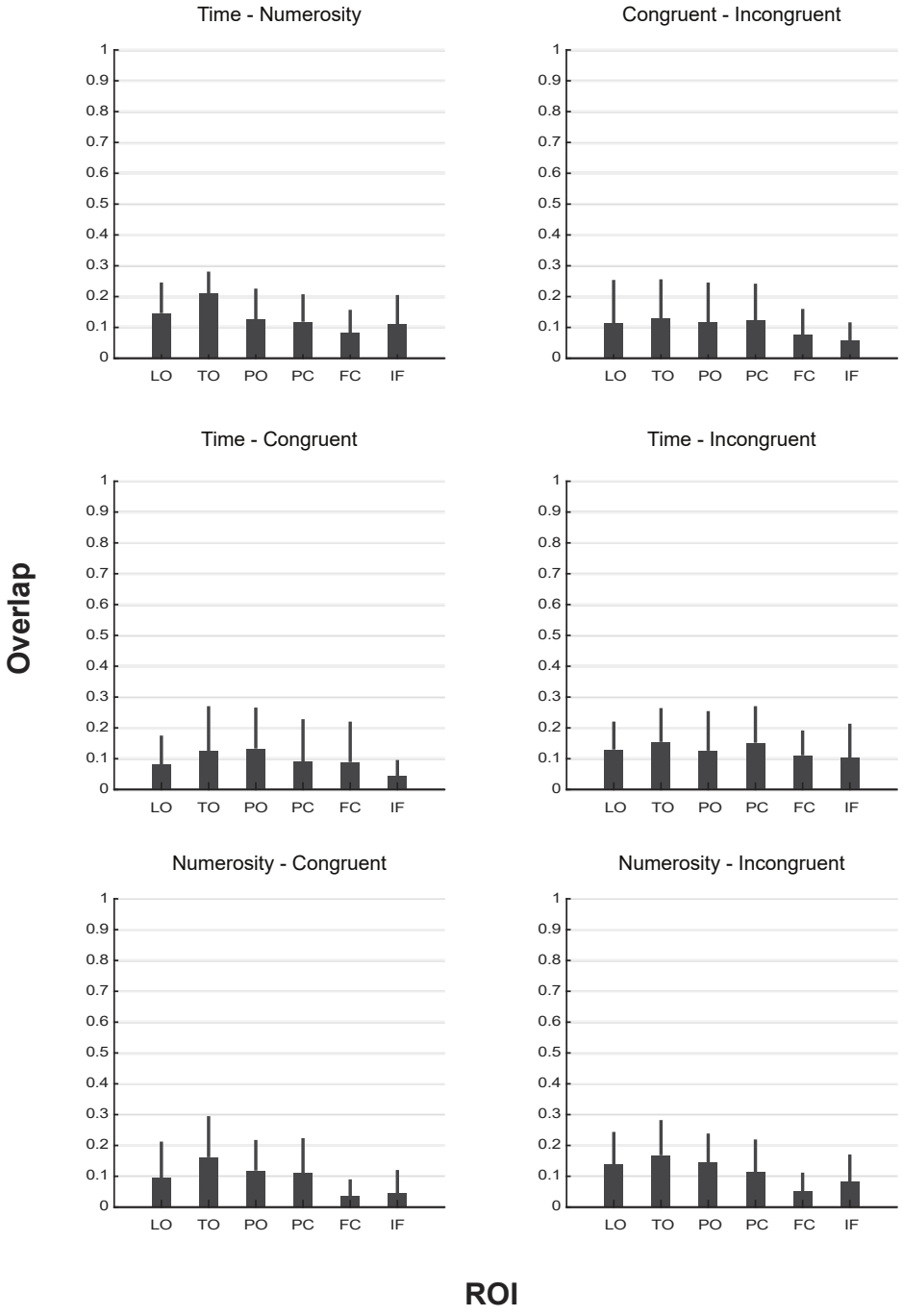


**Fig. S6 Map Overlap between conditions**

We computed the average overlap between duration and numerosity maps across subjects, for each pair of conditions (in different plots) in all ROIs in the x-axis. The y-axis represent the ratio between the number

of vertices in common between the maps and the total number of vertices in both maps. Error bars represent the standard error of the mean.

## Region of interest identification

### LO

| | | ATLAS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Benson | | | Wang | | | Destrieux | | |
| Condition | Hemi | LO1 | LO2 | Other | LO1 | LO2 | Other | S_oc_mid_Lun | G_oc_mid | Other |
| T | L | 34% | 31% | 35% | 24% | 21% | 55% | 55% | 32% | 13% |
| T | R | 49% | 16% | 35% | 37% | 10% | 52% | 62% | 20% | 18% |
| N | L | 48% | 21% | 31% | 22% | 22% | 57% | 53% | 26% | 21% |
| N | R | 52% | 27% | 21% | 24% | 18% | 58% | 70% | 21% | 9% |
| C | L | 40% | 26% | 34% | 22% | 36% | 43% | 70% | 23% | 6% |
| C | R | 53% | 38% | 9% | 38% | 20% | 43% | 75% | 22% | 3% |
| I | L | 50% | 30% | 20% | 20% | 24% | 56% | 52% | 33% | 15% |
| I | R | 44% | 40% | 16% | 30% | 10% | 60% | 59% | 36% | 5% |

### TO

| | | Benson | | | Wang | | | Destrieux | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Condition | Hemi | TO1 | TO2 | Other | TO1 | TO2 | Other | S_oc_ant | G_oc_mid | Other |
| T | L | 57% | 13% | 30% | 16% | 2% | 83% | 55% | 32% | 13% |
| T | R | 41% | 43% | 16% | 10% | 10% | 80% | 62% | 20% | 18% |
| N | L | 52% | 28% | 20% | 9% | 1% | 90% | 53% | 26% | 21% |
| N | R | 77% | 15% | 8% | 5% | 4% | 92% | 70% | 21% | 9% |
| C | L | 61% | 14% | 24% | 14% | 2% | 83% | 70% | 23% | 6% |
| C | R | 73% | 13% | 14% | 13% | 3% | 84% | 75% | 22% | 3% |
| I | L | 55% | 25% | 21% | 14% | 1% | 85% | 52% | 33% | 15% |
| I | R | 63% | 28% | 9% | 5% | 6% | 90% | 59% | 36% | 5% |

**Table S1a**

**Table S1b**

**ATLAS**

PO

| | | Wang | | | | | | Destrieux | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Condition** | **Hemi** | **V3a** | **V3b** | **IPS0** | **IPS1** | **IPS2** | **Other** | **S_oc_sup** | **G_oc_sup** | **S_IP_trans** | **G_par_sup** | **G_par_inf** | **Other** |
| **T** | **L** | 15% | 5% | 27% | 15% | 9% | 28% | 23% | 25% | 37% | 2% | 7% | 6% |
| **T** | **R** | 3% | 10% | 37% | 24% | 4% | 21% | 47% | 16% | 20% | 6% | 9% | 2% |
| **N** | **L** | 28% | 10% | 34% | 15% | 3% | 10% | 58% | 13% | 18% | 4% | 0% | 6% |
| **N** | **R** | 24% | 16% | 27% | 19% | 0% | 14% | 34% | 14% | 32% | 11% | 5% | 3% |
| **C** | **L** | 32% | 1% | 16% | 16% | 0% | 35% | 58% | 13% | 18% | 3% | 3% | 5% |
| **C** | **R** | 14% | 26% | 20% | 12% | 5% | 24% | 50% | 10% | 24% | 2% | 3% | 12% |
| **I** | **L** | 3% | 3% | 55% | 15% | 0% | 24% | 55% | 26% | 12% | 1% | 0% | 6% |
| **I** | **R** | 14% | 18% | 16% | 16% | 5% | 31% | 52% | 17% | 25% | 2% | 0% | 4% |

**PC**

| | | Wang | | | | | | | Destrieux | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Condition** | **Hemi** | **IPS1** | **IPS2** | **IPS3** | **IPS4** | **IPS5** | **SPL** | **Other** | **S_IP_trans** | **G_par_sup** | **Other** |
| **T** | **L** | 6% | 9% | 13% | 5% | 4% | 1% | 63% | 68% | 25% | 7% |
| **T** | **R** | 0% | 0% | 16% | 5% | 2% | 0% | 78% | 69% | 21% | 10% |
| **N** | **L** | 0% | 3% | 8% | 9% | 5% | 0% | 74% | 69% | 25% | 6% |
| **N** | **R** | 0% | 0% | 22% | 9% | 1% | 1% | 66% | 62% | 37% | 1% |
| **C** | **L** | 0% | 13% | 12% | 3% | 1% | 0% | 71% | 63% | 29% | 8% |
| **C** | **R** | 0% | 0% | 9% | 5% | 1% | 0% | 85% | 79% | 20% | 1% |
| **I** | **L** | 7% | 14% | 9% | 3% | 1% | 1% | 65% | 62% | 31% | 7% |
| **I** | **R** | 0% | 1% | 19% | 4% | 1% | 0% | 75% | 76% | 17% | 7% |

**ATLAS**

**FC**

| | | Wang | | Destrieux | | | |
|---|---|---|---|---|---|---|---|
| **Condition** | **Hemi** | **FEF** | **Other** | **S_prec_sup** | **G_prec** | **S_prec_inf** | **Other** |
| **T** | **L** | 27% | 73% | 68% | 31% | 0% | 1% |
| **T** | **R** | 0% | 100% | 56% | 34% | 0% | 10% |
| **N** | **L** | 18% | 82% | 54% | 44% | 0% | 1% |
| **N** | **R** | 0% | 100% | 25% | 49% | 13% | 14% |
| **C** | **L** | 25% | 75% | 83% | 17% | 0% | 0% |
| **C** | **R** | 2% | 98% | 44% | 39% | 0% | 17% |
| **I** | **L** | 41% | 59% | 83% | 9% | 0% | 8% |
| **I** | **R** | 3% | 97% | 43% | 20% | 19% | 18% |

**IF**

| | | Destrieux | | | |
|---|---|---|---|---|---|
| **Condition** | **Hemi** | **S_prec_inf** | **S_front_inf** | **G_front_inf** | **Other** |
| **T** | **L** | 72% | 0% | 1% | 27% |
| **T** | **R** | 61% | 5% | 2% | 33% |
| **N** | **L** | 85% | 0% | 0% | 15% |
| **N** | **R** | 76% | 0% | 0% | 24% |
| **C** | **L** | 63% | 1% | 0% | 37% |
| **C** | **R** | 43% | 2% | 0% | 55% |
| **I** | **L** | 70% | 4% | 10% | 16% |
| **I** | **R** | 59% | 5% | 6% | 30% |

**Table S1c**

**Table S1 ROI identification.** The tables shows for each ROI the average, across participants, of the percentage of vertices belonging to regions identified with three atlases: Benson, Wang and Destrieux (see Methods – ROIs selection) in the different conditions and hemispheres. Condition names are abbreviated as in the main text: T for Time, N for numerosity, C and I for Congruent and Incongruent respectively; L stands for left hemisphere and R for right hemisphere. The table is divided in three sections which separate the selected ROI in three macro areas: occipital in section S1a, parietal S1b and frontal S1c. In each section each column is named with the name of the label in the appropriate Atlas, Other signifies the percentage of

vertices which could belong either to different labels or to regions not covered by the specified atlas. A vertical line divide the columns of different atlases. Diestrieux abbreviations: S_oc_mid_Lun=Middle Occipital Sulcus & Lunatus, G_oc_mid=Middle Occipital Gyrus, S_oc_ant=Anterior Occipital Sulcus, S_oc_sup=Superior and Transversal Occipital Sulcus, G_oc_sup= Superior Occipital Gyrus, S_IP_trans=Sulcus IntraParietal and Parietal transverse, G_par_sup=Superior Parietal Gyrus, G_par_inf=Inferior Parietal Gyrus Angular Part, S_prec_sup=Precentral Sulcus Superior part, G_prec=Precentral Gyrus, S_prec_inf=Precentral Sulcus Inferior part, S_front_inf=Inferior Frontal Sulcus, G_front_inf=Inferior Frontal Gyrus Opercular part.

## Complete Statistics

## Analysis of preference and topography

Here we report the complete set of statistics summarized in the main text for each figure and panel when appropriate. Details of the statistical analysis can be found in the Methods section, in brief, we use a single LME model to compare both the shift in duration ($\mu_d$) and numerosity preference ($\mu_n$) (Figure 2a and 2d) and the quality of their topographic arrangement across conditions (Figure 3a and 3b). We estimated this model in each ROI separately. We also employed a second LME model, estimated per each condition separately, to understand changes in the two μ parameters across ROIs (Figure 2c and Figure 2f). In this section conditions are abbreviated as in the main text: T for Time, N for Numerosity, C for Congruent and I for Incongruent. For each model we report, marginal and conditional $R^2$ (R2m and R2c respectively), Type III ANOVA on model estimate with Satterthwaite method for degrees of freedom, and the meaningful comparisons in estimated marginal means (or least squares mean difference). All the values reported are truncated to the second decimal point. Reported p values are Bonferroni corrected for multiple comparisons. Degrees of freedom are estimated using Kenward-rogers method.

## Figure 2

### Panel a

- **LO**:
  - R2m: .61 R2c: .65
  - Condition: F(3,887.14) = 76.55 p < .0001; Distance: F(1,886.98) = 90.18 p < .0001
    Interaction: F(3,886.98) =10.31 p < .0001
  - T – C = -16.44 t(887.67) = -11.61 p < .0001;
    T – I = 1.24 t(887.67) = 0.877 p = NS;
    C – I = 17.68 t(886.99) = 12.81 p < .0001;
- **TO**:
  - R2m: .69 R2c: .79
  - Condition: F(3,787.22) = 154.40 p < .0001; Distance: F(1,786.97) = 121.15 p < .0001
    Interaction: F(3,786.97) = 19.26 p < .0001
  - T – C = -22.59 t(787.88) = -18.46 p < .0001
    T – I = -8.85 t(787.36) = -7.59 p < .0001
    C – I = 13.73 t(788.38) = 11.96 p < .0001
- **PO**:
  - R2m: .55 R2c: .61
  - Condition: F(3,867.20) = 63.11 p < .0001; Distance: F(1,866.99) = 114.47 p < .0001
    Interaction: F(3,866.99) = 11.63 p < .0001
  - T – C = -14.55 t(868.60) = -9.41 p < .0001
    T – I = -8.63 t(868.18) = -5.74 p < .0001
    C – I = 5.91 t(867.47) = 3.85 p < .001
- **PC**:
  - R2m: .65 R2c: .68
  - Condition: F(3,867.33) = 91.23 p < .0001; Distance: F(1,867.03) = 115.78 p < .0001
    Interaction: F(3,867.03) = 20.06 p < .0001
  - T – C = -18.99 t(868.93) = -14.00 p < .0001
    T – I = -7.92 t(868.34) = -6.01 p < .0001
    C – I = 11.06 t(868.93) = 8.15 p < .0001
- **FC**:
  - R2m: .67 R2c: .68

- Condition: F(3,649.39) = 86.33 p < .0001; Distance: F(1,646.60) = 68.91 p < .0001
  Interaction: F(3,646.60) = 5.83 p < .001
- T – C = -34.64 t(444.43) = -19.84 p < .0001
  T – I = -14.34 t(536.30) = -8.34 p < .0001
  C – I = 20.30 t(651.82) = 12.13 p < .0001

- **IF**:
  - R2m: .66 R2c: .69
  - Condition: F(3,767.85) = 95.88 p < .0001; Distance: F(1,766.94) = 101.72 p < .0001
    Interaction: F(3,766.94) = 18.94 p < .0001
  - T – C = -30.27 t(769.32) = -19.02 p < .0001
    T – I = -16.20 t(769.96) = -10.80 p < .0001
    C – I = 14.06 t(771.15) = 8.57 p < .0001

**Panel d**

- **LO**:
  - R2m: .52 R2c: .70
  - Condition: F(3,885.03) = 36.06 p < .0001; Distance: F(1,884.99) = 202.97 p < .0001
    Interaction: F(3,884.99) = 36.56 p < .0001
  - N – C = 20.28 t(885.24) = 16.619 p < .0001;
    N – I = -0.31 t(885.23) = -0.25 p = NS;
    C – I = -20.60 t(884.99) = -17.79 p < .0001;
- **TO**:
  - R2m: .41 R2c: .56
  - Condition: F(3,787.33) = 18.57 p < .0001; Distance: F(1,786.98) = 160.00 p < .0001
    Interaction: F(3,786.98) = 11.83 p < .0001
  - N – C = 10.58 t(789.20) = 8.70 p < .0001
    N – I = -7.94 t(788.51) = -6.85 p < .0001
    C – I = -18.52 t(788.91) = -16.45 p < .0001
- **PO**:
  - R2m: .50 R2c: .63
  - Condition: F(3,867.10) = 28.97 p < .0001; Distance: F(1,867.01) = 191.68 p < .0001
    Interaction: F(3,867.01) = 29.40 p < .0001
  - N – C = 23.38 t(867.38) = 19.76 p < .0001
    N – I = 0.09 t(867.25) = 0.07 p = NS
    C – I = -23.28 t(867.21) = -19.33 p < .0001
- **PC**:
  - R2m: .50 R2c: .56
  - Condition: F(3,867.24) = 14.46 p < .0001; Distance: F(1,867.00) = 174.22 p < .0001
    Interaction: F(3,867.00) = 23.79 p < .0001
  - N – C = 17.91 t(867.83) = 15.43 p < .0001
    N – I = -2.92 t(867.47) = -2.59 p = NS
    C – I = -20.84 t(868.54) = -17.51 p < .0001
- **FC**:
  - R2m: .47 R2c: .62
  - Condition: F(3,647.81) = 38.68 p < .0001; Distance: F(1,646.97) = 114.87 p < .0001
    Interaction: F(3,646.97) = 17.39 p < .0001

- N – C = 0.25 t(649.66) = 0.17 p = NS
  N – I = -14.48 t(649.91) = -9.62 p < .0001
  C – I = -14.74 t(647.75) = -17.68 p < .0001

- **IF**:
  - R2m: .39 R2c: .58
  - Condition: F(3,767.21) = 10.93 p < .0001; Distance: F(1,766.99) = 170.95 p < .0001
    Interaction: F(3,766.99) = 19.12 p < .0001
  - N – C = 9.28 t(768.64) = 6.11 p < .0001
    N – I = -8.15 t(767.40) = -5.81 p < .0001
    C – I = -17.43 t(768.29) = -11.57 p < .0001

**Panel c**

- **TIME**
  - R2m: .26 R2c: .44
  - ROI: F(6,1341.20) = 6.52 p < .0001; Distance: F(1,1341.00) = 474.09 p < .0001
    Interaction: F(6,1341.0) = 0.79 p = NS
  - LO – TO = 6.27 t(1203.3) = 3.81 p < .01
    LO – PO = 6.82 t(1203) = 4.38 p < .001
    LO – PC = 7.70 t(1203.4) = 4.92 p < .0001
    LO – FC = 18.44 t(1203.9) = 10.73 p < .0001
    LO – IF = 11.95 t(1203.4) = 7.64 p < .0001
    TO – PO = 0.54 t(1203.3) = 0.33 p = NS
    TO – PC = 1.42 t(1203.3) = 0.86 p = NS
    TO – FC = 12.164 t(1203.3) = 6.83p < .0001
    TO – IF = 5.67 t(1203.2) = 3.45p < .01
    PO – PC = 0.87 t(1203.4) = 0.56p = NS
    PO – FC = 11.62 t(1203.9) = 6.76p < .0001
    PO – IF = 5.13 t(1203.4) = 3.28p < .05
    PC – FC = 10.74 t(1203.9) = 6.25p < .0001
    PC – IF = 4.25 t(1203.4) = 2.72p = NS
    FC – IF = -6.48 t(1203.4) = -3.80 p < .01
- **CONGRUENT**
  - R2m: .17 R2c: .44
  - ROI: F(6,1301.20) = 11.63 p < .0001; Distance: F(1,1301.00) = 190.23 p < .0001
    Interaction: F(6,1301.0) = 0.96 p = NS
  - LO – TO = 2.30 t(1143.5) = 1.70 p = NS
    LO – PO = 9.91 t(1143.3) = 7.37 p < .0001
    LO – PC = 4.20 t(1143.3) = 3.13 p < .05
    LO – FC = -1.99 t(1143.9) = -1.37 p = NS
    LO – IF = 1.03 t(1143.8) = 0.71 p = NS
    TO – PO = 7.60 t(1143.9) = 5.35 p < .0001
    TO – PC = 1.90 t(1143.9) = 1.34 p = NS
    TO – FC = -4.29 t(1144.5) = -2.81 p = NS
    TO – IF = -1.27 t(1144.6) = -0.83 p = NS
    PO – PC = -5.70 t(1143.4) = -4.05 p < .0001
    PO – FC = -11.90 t(1144.2) = -7.87 p < .0001
    PO – IF = -8.88 t(1143.4) = -5.95 p < .0001

PC – FC = -6.20 t(1143.8) = -4.13 p < .0001
PC – IF = -3.17 t(1143.4) = -2.13 p = NS
FC – IF = 3.02 t(1144.3) = 1.89 p = NS

- **INCONGRUENT**
  - R2m: .08 R2c: .56
  - ROI: F(6,1441) = 17.21 p < .0001; Distance: F(1,1441) = 39.38 p < .0001 Interaction: F(6,1441) = 3.68 p < .05
  - LO – TO = -3.51 t(1263) = -3.34 p < .05
    LO – PO = -2.34 t(1263) = -2.17 p = NS
    LO – PC = -3.35 t(1263.1) = -3.12 p < .05
    LO – FC = -0.90 t(1263.3) = -0.75 p = NS
    LO – IF = -6.82 t(1263.1) = -6.17 p < .0001
    TO – PO = 1.17 t(1263) = 1.09 p = NS
    TO – PC = 0.15 t(1263.1) = 0.14 p = NS
    TO – FC = 2.61 t(1263.3) = 2.19 p = NS
    TO – IF = -3.31 t(1263.1) = -2.99 p < .05
    PO – PC = -1.01 t(1263.1) = -0.92 p = NS
    PO – FC = 1.44 t(1263.3) = 1.19 p = NS
    PO – IF = -4.48 t(1263.2) = -3.96 p < .01
    PC – FC = 2.45 t(1263.3) = 2.03 p = NS
    PC – IF = -3.46 t(1263.1) = -3.07 p < .05
    FC – IF = -5.92 t(1263.1) = -4.83 p < .0001

**Panel f**

- **NUMEROSITY**
  - R2m: .29 R2c: .45
  - ROI: F(6,1401.2) = 16.41 p < .0001; Distance: F(1,1401.0) = 457.83 p < .0001 Interaction: F(6,1401.0) = 6.19 p < .0001
  - LO – TO = 19.17 t(1223.5) = 11.76 p < .0001
    LO – PO = 10.44 t(1223.4) = 6.87 p < .0001
    LO – PC = 12.43 t(1223.4) = 8.18 p < .0001
    LO – FC = 18.91 t(1223.6) = 11.56 p < .0001
    LO – IF = 17.44 t(1223.4) = 7.64 p < .0001
    TO – PO = -8.73 t(1224.5) = -5.52 p < .0001
    TO – PC = -6.73 t(1224.5) = -4.26 p < .001
    TO – FC = -0.25 t(1224.5) = -0.15 p = NS
    TO – IF = -1.72 t(1223.9) = -1.05 p = NS
    PO – PC = 1.99 t(1223) = 1.38 p = NS
    PO – FC = 8.47 t(1223.4) = 5.41 p < .0001
    PO – IF = 7.00 t(1223.4) = 4.60 p < .0001
    PC – FC = 6.48 t(1223.4) = 4.13 p < .001
    PC – IF = 5.00 t(1223.4) = 2.02 p < .05
    FC – IF = -1.47 t(1223.5) = -0.90 p = NS
- **CONGRUENT**
  - R2m: .26 R2c: .38
  - ROI: F(6,1299.4) = 16.76 p < .0001; Distance: F(1,1299.0) = 171.81 p < .0001 Interaction: F(6,1299.0) = 0.48 p = NS
  - LO – TO = 10.40 t(1142.1) = 8.32 p < .0001
    LO – PO = 11.56 t(1141.5) = 9.30 p < .0001

LO – PC = 7.83 t(1141.5) = 6.31 p < .0001
LO – FC = -1.80 t(1142.9) = -1.34 p = NS
LO – IF = 3.69 t(1142.6) = 2.76 p = NS
TO – PO = 1.16 t(1142.9) = 0.88 p = NS
TO – PC = -2.56 t(1143) = -1.95 p = NS
TO – FC = -12.20 t(1144.1) = -8.66 p < .0001
TO – IF = -6.70 t(1144.1) = -4.75 p < .0001
PO – PC = -3.72 t(1141.8) = -2.86 p = NS
PO – FC = -13.36 t(1143.4) = -9.57 p < .0001
PO – IF = -7.86 t(1141.8) = -5.71 p < .0001
PC – FC = -9.64 t(1142.6) = -6.95 p < .0001
PC – IF = -4.14 t(1141.8) = -3.00 p < .05
FC – IF = 5.50 t(1143.7) = 3.72 p < .01

- **INCONGRUENT**
  - R2m: .20 R2c: .43
  - ROI: F(6,1441.1) = 15.99 p < .0001; Distance: F(1,1441) = 241.56 p < .0001 Interaction: F(6,1441) = 2.06 p = NS
  - LO – TO = 12.57 t(1263) = 9.61 p < .0001
    LO – PO = 9.21 t(1263.1) = 6.88 p < .0001
    LO – PC = 6.48 t(1263.1) = 4.84 p < .0001
    LO – FC = 7.15 t(1263.7) = 4.83 p < .0001
    LO – IF = 10.03 t(1263.2) = 7.29 p < .0001
    TO – PO = -3.35 t(1263.1) = -2.50 p = NS
    TO – PC = -6.08 t(1263.1) = -4.54 p < .0001
    TO – FC = -5.41 t(1263.7) = -3.65 p < .01
    TO – IF = -2.53 t(1263.2) = -1.84 p = NS
    PO – PC = -2.72 t(1263.3) = -1.98 p = NS
    PO – FC = -2.05 t(1263.7) = -1.36 p = NS
    PO – IF = 0.82 t(1263.4) = 0.58 p = NS
    PC – FC = 0.66 t(1263.7) = 0.44 p = NS
    PC – IF = 3.55 t(1263.1) = 2.53 p = NS
    FC – IF = 2.88 t(1263.3) = 1.88 p = NS

## Figure 3

### Panel a

- **LO**

| | |
|---|---|
| C – T = -0.36 | t(886.99) = -1.47 p = NS |
| I – T = -0.91 | t(886.99) = -3.73 p < .001 |
| I – C = -0.55 | t(886.99) = -2.30 p = NS |

- **TO**

| | |
|---|---|
| C – T = -0.80 | t(786.97) = -3.82 p < .001 |
| I – T = -0.95 | t(786.97) = -4.75 p < .0001 |
| I – C = -0.15 | t(786.97) = -0.79 p = NS |

- **PO**

| | |
|---|---|
| C – T = -0.79 | t(867.00) = 2.98 p < .05 |
| I – T = -0.86 | t(867.00) = -3.32 p < .01 |
| I – C = -0.07 | t(867.00) = -0.26 p = NS |

- **PC**

| | |
|---|---|
| C – T = -0.69 | t(867.04) = -2.99 p < .05 |
| I – T = -1.11 | t(867.04) = -4.91 p < .0001 |
| I – C = -0.42 | t(867.04) = -1.80 p = NS |

- **FC**

| | |
|---|---|
| C – T = -0.49 | t(646.61) = -1.71 p = NS |
| I – T = -0.67 | t(646.61) = -2.33 p = NS |
| I – C = -0.17 | t(646.61) = -0.61 p = NS |

- **IF**

| | |
|---|---|
| C – T = -1.02 | t(766.95) = -3.74 p < .001 |
| I – T = -0.92 | t(766.95) = -3.59 p < .01 |
| I – C = 0.09 | t(766.95) = 0.35 p = NS |

### Panel b

- **LO**

| | |
|---|---|
| C – N = -1.50 | t(884.99) = -7.14 p < .0001 |
| I – N = -1.09 | t(884.99) = -5.19 p < .0001 |
| I – C = 0.41 | t(884.99) = 2.06 p = NS |

- **TO**

| | |
|---|---|
| C – N = -0.71 | t(786.98) = -3.46 p < .01 |
| I – N = -0.28 | t(786.98) = -1.45 p = NS |
| I – C = 0.42 | t(786.98) = 2.22 p = NS |

- **PO**

| | |
|---|---|
| C – N = -1.02 | t(867.01) = -5.03 p < .0001 |
| I – N = -0.86 | t(867.01) = -4.34 p < .0001 |
| I – C = 0.16 | t(867.01) = 0.78 p = NS |

- **PC**

| | |
|---|---|
| C – N = -0.59 | t(867.01) = -2.95 p < .05 |
| I – N = 0.14 | t(867.01) = 0.72 p = NS |
| I – C = 0.73 | t(867.01) = 3.59 p < .01 |

- **FC**

| | |
|---|---|
| C – N = -1.28 | t(646.98) = -5.14 p < .0001 |
| I – N = -1.02 | t(646.98) = -4.11 p < .0001 |
| I – C = 0.25 | t(646.98) = 0.99 p = NS |

- **IF**

| | |
|---|---|
| C – N = -0.81 | t(766.99) = -3.20 p < .001 |
| I – T = -0.33 | t(766.99) = -1.39 p = NS |
| I – C = 0.48 | t(766.99) = 1.89 p = NS |

## Aspect Ratio Analysis

Here we report the full set of multiple comparison statistics of the analysis of the Aspect Ratio (Figure 4a in the main text) for each ROI separately. Values are truncated at the second decimal point. All p values are Bonferroni corrected for multiple comparisons.

- LO

  N – T = 3.83 t(108.90) = 1.11p = NS
  C – T = -10.05 t(108.90) = -2.91 p < .05
  I – T = -11.61 t(108.90) = -3.36 p < .01
  C – N = -13.89 t(108.90) = -4.02 p < .001
  I – N = -15.44 t(108.90) = -4.48 p < .001
  C – I = 1.55 t(108.90) = 0.45p = NS

- TO

  N – T = 1.76 t(109.41) = 0.48p = NS
  C – T = -12.72 t(109.41) = -3.51 p < .001
  I – T = -12.66 t(108.90) = -3.67 p < .01
  C – N = -14.48 t(109.99) = -3.82 p < .01
  I – N = -14.44 t(109.41) = -3.08 p < .001
  C – I = -0.05 t(109.41) = -0.01 p = NS

- PO

  N – T = -0.96 t(108.90) = -0.28 p = NS
  C – T = -10.53 t(108.90) = -3.05 p < .05
  I – T = -15.32 t(108.90) = -4.44 p < .001
  C – N = -9.57 t(108.90) = -2.77 p < .05
  I – N = -14.35 t(108.90) = -4.16 p < .001
  C – I = 4.78 t(108.90) = 1.38p = NS

- PC

  N – T = 4.04 t(108.90) = 1.17p = NS
  C – T = -12.12 t(108.90) = -3.51 p < .01
  I – T = -15.09 t(108.90) = -4.37 p < .001
  C – N = -16.17 t(108.90) = -4.68 p < .0001
  I – N = -19.13 t(108.90) = -5.54 p < .0001
  C – I = 2.96 t(108.90) = 0.85p = NS

- FC

  N – T = 0.79 t(109.43) = 0.22p = NS
  C – T = -10.21 t(110.03) = -2.69 p < .05
  I – T = -13.41 t(110.03) = -3.54 p < .01
  C – N = -11.01 t(109.43) = -3.04 p < .05
  I – N = -14.21 t(109.43) = -3.92 p < .0001
  C – I = 3.19 t(108.90) = 0.84p = NS

- IF

  N – T = 4.24 t(108.90) = 1.23p = NS
  C – T = -11.58 t(109.43) = -3.19 p < .05
  I – T = -13.20 t(108.90) = -3.82 p < .01
  C – N = -15.82 t(109.43) = -4.37 p < .001
  I – N = -17.45 t(108.90) = -5.06 p < .0001
  C – I = 1.62 t(109.43) = 0.44p = NS