Supplementary Materials for Hasson et al. "Congenital blindness is associated with large-scale reorganization of anatomical networks"

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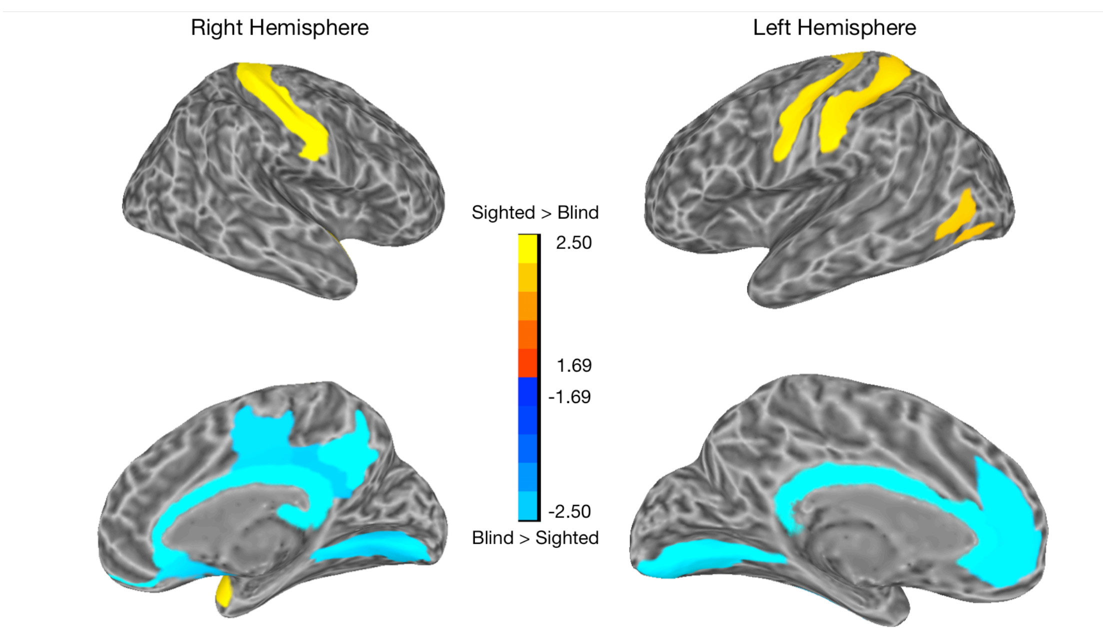
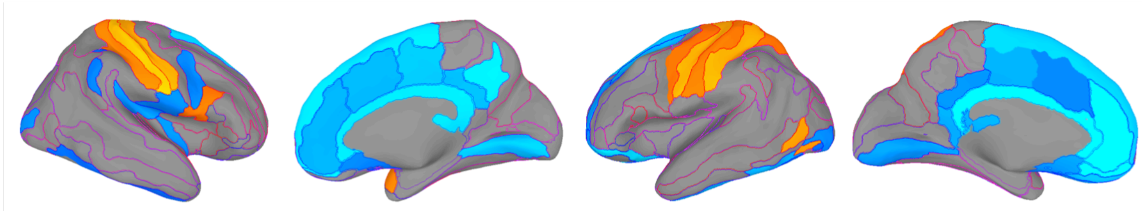
Supplementary Figure 1: Tests for differences in CT between blind and sighted for all brain regions parcellated by the FreeSurfer's *Destrieux* atlas



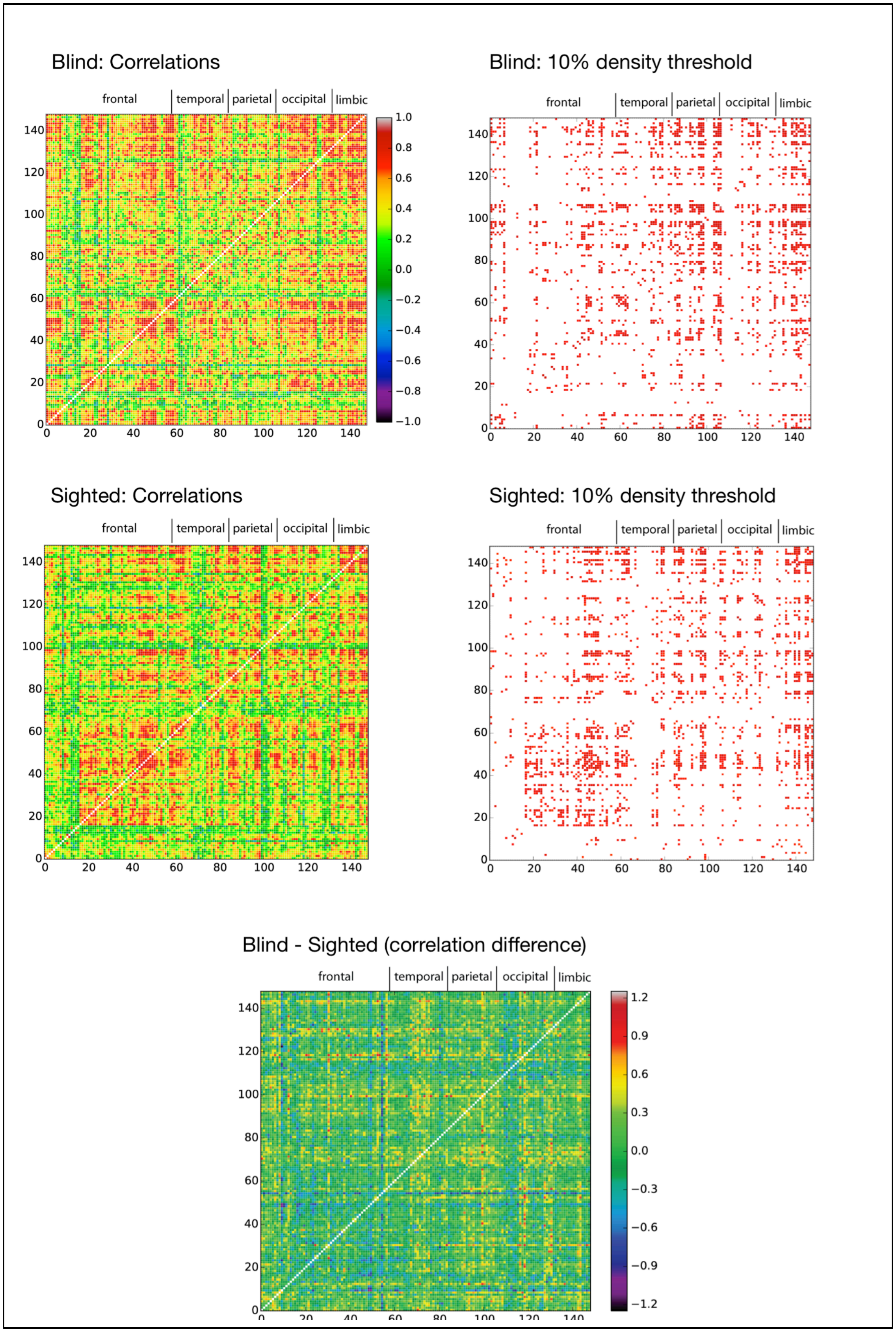
Brain regions where cortical thickness differed for blind and sighted. For each of the 148 brain regions in the FreeSurfer parcellation we evaluated whether cortical thickness differed between groups using a between-samples T-test. Warm/Cold colors idicate regions with greater CT for sighted/blind.

Supplementary Figure 2: Differential covariance network identified via PLS

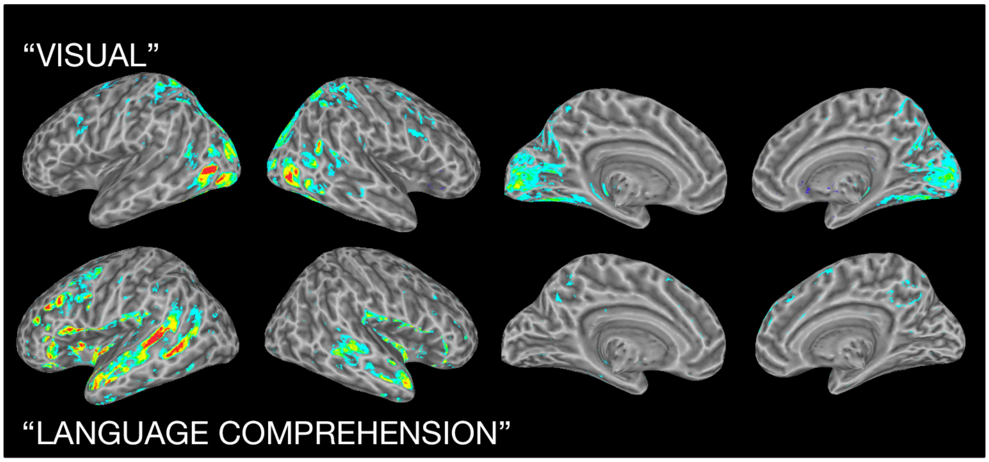


Differential-covariance network. The figure shows brain-saliences associated with the first component identified by a PLSR covariance analysis. This component significantly discriminated sighted from blind, and the regions shown are those whose loadings showed low variance across bootstrap solutions.

Supplementary Figure 3: Functional connectivity matrices for blind and sighted



Supplementary Figure 4: NeuroSynth results for “visual” and “language comprehension”



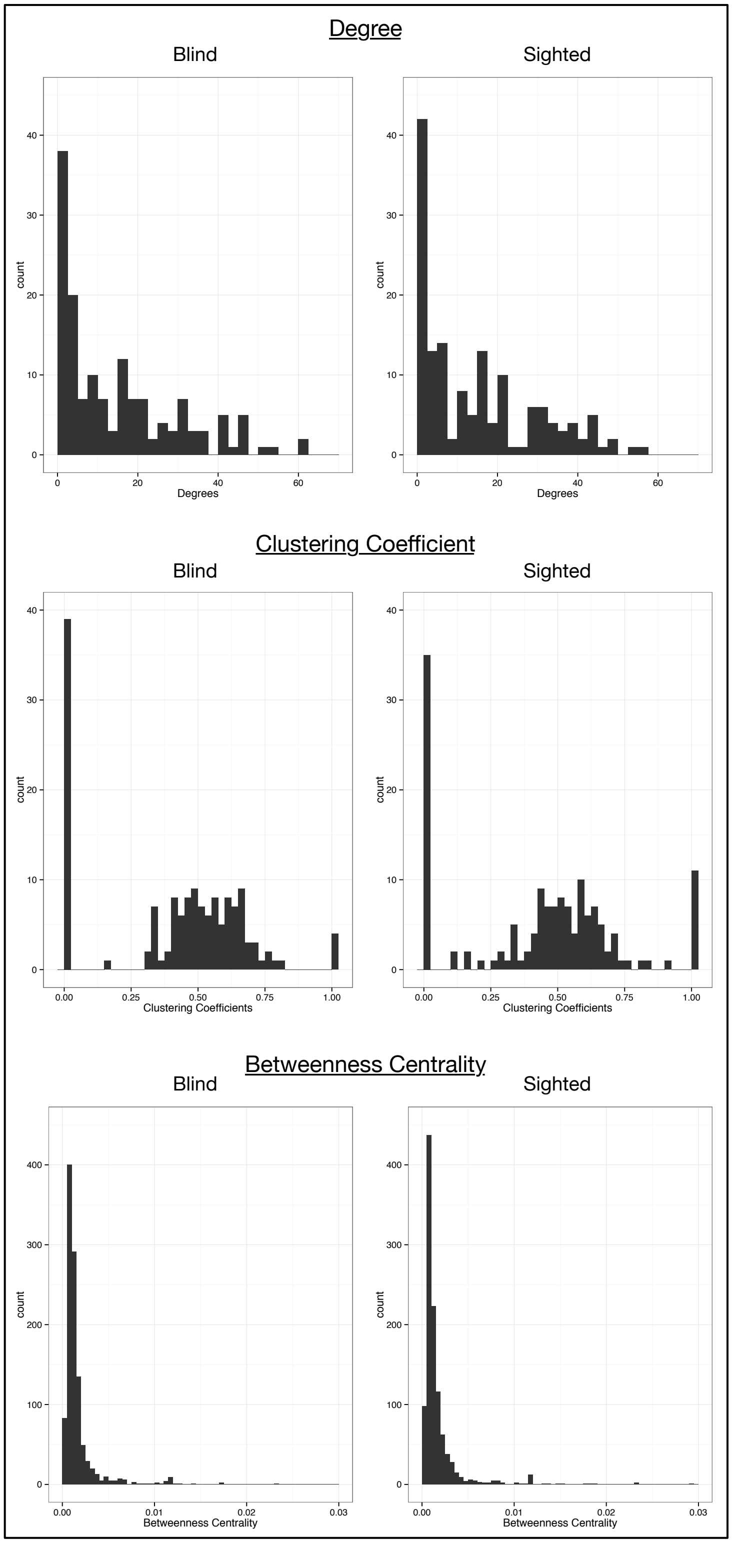
Neurosynth Meta Analysis for “visual” and “language comprehension”. We labeled “language” and “visual” regions based on a meta-analysis procedure (see Text) which identifies brain areas (Talairach or MNI coordinates) whose mention in a neuroimaging paper is diagnostic of the terms “visual” or “language comprehension” being frequently mentioned in the work (a valid reverse inference, see (Yarkoni, Poldrack, Nichols, Van Essen, & Wager, 2011)). Regions diagnostic of “visual” comprised dorsal and ventral streams, and regions diagnostic of “language comprehension” mainly consisted of perisylvian regions bilaterally.

Supplementary analysis: Nodal features

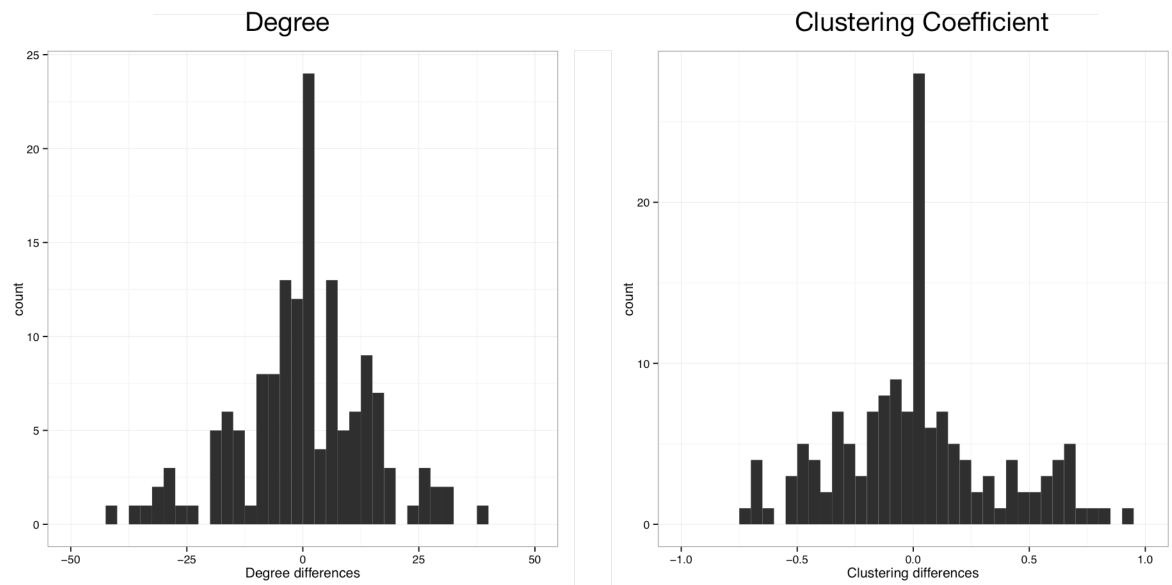
Our main interests in the current work were in the partition structure of blind and sighted networks, the status of language and visual regions within those, and identification of sub-networks or region-pairs whose covariance discriminated the populations. However, we also conducted a concise examination of three nodal features that are typically used to characterize network topology: Betweenness centrality, node degree distribution, and local clustering coefficient. *Betweenness centrality* is a property of any edge between two nodes and is defined by the number of shortest path lengths between nodes that pass through that edge. *Nodal degree* and *local clustering coefficient* are nodal properties, which quantify, respectively, the number of connections a node has and the degree to which its neighbors are connected within themselves (i.e., form a clique). As shown in Supplementary Figure 5, the distributions of these features were similar for blind and sighted.

However, a closer inspection suggests that the distributions of these values, even when highly similar, may conceal basic differences of the sort we identified throughout the manuscript. This is due to the fact that even if two distributions are identical, any given node can greatly shift in its position within the distribution. For instance, two node-degree distributions can be identical even if it were the case that region *A* had 60 connections in the blind and 10 in sighted, whereas region *B* had 10 connections in blind and 60 in sighted. In this way, such global topological metrics constitute summaries that may not directly speak to the specific organizational features that were of interest in the current work. To resolve this issue, we derived, for each node, the difference in node degree and clustering coefficient between the two populations and examined the resulting "difference distributions". We found that these difference distributions indicated a considerable number of nodes whose degree or clustering coefficient strongly differed between blind and sighted (See Supplementary Figure 6). For this reason, while the topological distributions may suggest common abstract network-level characteristics, the specific instantiation of these networks differed between blind and sighted.

Supplementary Figure 5: Distributions of node degree, clustering coefficient and betweenness centrality in blind and sighted



Supplementary Figure 6: Distributions of differences for nodal parameters



Differences in nodal distributions. Differences in node degree and clustering coefficient for each of the 148 nodes in the structural network. As seen, while many (~25) of the 148 nodes had similar node degree or clustering strength in sighted and blind (Difference = 0), there were also sizeable shifts in these parameters. Some nodes showed a much higher degree for sighted, whereas others showed a much higher degree for blind. For instance, the inferior occipital gyrus had 38 more connections in sighted, whereas the right posterior lateral fissure had 41 more connections in blind.

Supplementary Table 1: Characteristics of the blind participants.

Subj.	Age	Sex	Hand	Residual visual perception	Onset	Cause of blindness	Education	Musical Experience
EB1	45	M	R	No	0	Retinopathy of prematurity	University	Yes
EB2	62	M	R	Diffuse light	0	Congenital cataracts	College	Yes
EB3	55	M	R	No	0	Electrical burn of optic nerve bilaterally	High School	No
EB4	28	M	R	No	0	Retinopathy of prematurity	University	Yes
EB5	57	F	R	No	0	Chorioretinal atrophy associated to toxoplasmosis	College	Yes
EB6	31	M	R	No	0	Leber's congenital amaurosis	University	Yes
EB7	54	M	R	No	0	Glaucoma	University	Yes
EB8	23	M	R	Diffuse light	0	Glaucoma and microphtalmia	University	Yes
EB9	43	M	R	No	0	Retinopathy of prematurity	High school	Yes
EB10	44	M	R	Diffuse light	0	Leber's congenital amaurosis	University	No
EB11	31	F	R/A	No	0	Retinopathy of prematurity	High school	No
EB12	60	F	R	No	0	Retinopathy of prematurity	High school	Yes
EB13	33	F	R	No	0	Glaucoma	High school	No
EB14	58	F	R	No	0	Retinopathy of prematurity	College	Yes
EB15	51	M	R/A	No	0	Major eye infection (Thalidomide victim)	University	Yes
EB16	36	F	R	No	0	Bilateral Retinoblastoma	College	No
EB17	51	M	R	No	0	Glaucoma	University	Yes
EB18	48	M	R	No	0	Glaucoma	University	Yes

Supplementary Table 2: Summary of regressions involving the superior occipital gyrus where the Group x Region interaction was significant.

Predicted region	Predicting region	Slope sighted	Slope blind	Correlation sighted	Correlation blind
L. SOG	L. AG	0.68	0.18	0.41	0.23
L. SOG	R InsCirc.S	-0.34	0.1	-0.22	0.19
L. SOG	L.LingualG	0.90	0.25	0.57*	0.39
L. SOG	R.MOcG	0.72	0.07	0.57*	0.12
L. SOG	R.MOcS	0.58	-0.02	0.49*	-0.04
L. SOG	R.CingMargS	0.90	0.02	0.70** [a]	0.03
L. SOG	L.ParacentralG	0.26	0.05	0.27	0.09
L. SOG	L.JensenS	0.06	-0.09	0.19	-0.33
R. SOG	R.LingualG	0.97	0.09	0.67** [a]	0.10
R. SOG	R.MOcS	0.90	-0.02	0.76*** [a]	-0.02
R. SOG	L.ParOccS	0.87	0.25	0.88*** [a]	0.36
R. SOG	R.SubparietalS	1.21	0.22	0.80*** [a]	0.29
R.SupParG	R.SOG	0.68	0.11	0.80*** [a]	0.22

Note1: Acronyms for FreeSurfer regions: SOG: superior occipital gyrus; AG: angular gyrus; InsCirc.S: inferior insular circular sulcus. MOcG: middle occipital gyrus; MOcS: middle occipital lunatus; CingMargS: cingulate sulcus (marginal branch). ParOccS: parieto-occipital sulcus.

Note2: Significance of correlations: * $p < .05$, ** $p < .01$, *** $p < .001$. Correlations were calculated after partialling the effect of age from both regions.
[a] Superscript indicates that the two correlations are significantly different.

References

Yarkoni, T., Poldrack, R. A., Nichols, T. E., Van Essen, D. C., & Wager, T. D. (2011). Large-scale automated synthesis of human functional neuroimaging data. *Nature methods, 8*(8), 665-670. doi: 10.1038/nmeth.1635