Supporting Information

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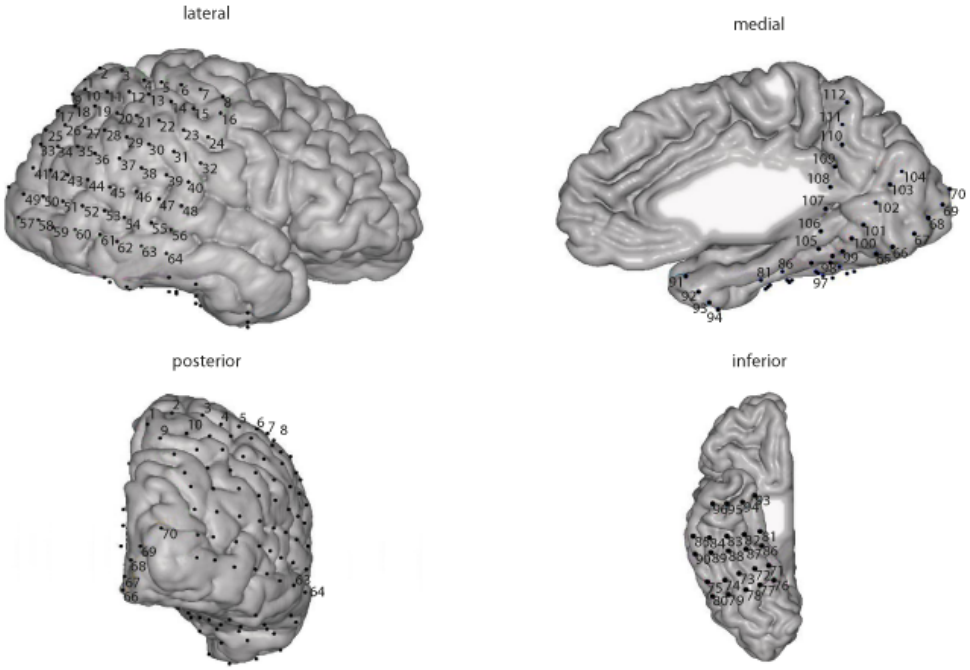
Movie S1 – Spatio-temporal evolution of visual responses along the posterior cortex (see electronic material).

The movie depicts the progression of significant visual responses in all electrodes over time, for 250 milliseconds. Three anatomical views are presented; posterior, inferior and medial. The electrode numbers and locations match those in Fig. 2 and Fig. S1. A green colored dot appears over an electrode whenever its activity exceeds the calculated threshold (see methods section 'Onset latency estimation' and Fig. 1). The colors represent the absolute amplitude of the response, such that lighter greens represent higher absolute amplitude.

1. Full tables of all electrodes tested, significant onset latency estimates (OLEs) with their temporal errors.



Electrode numbers in the following tables correspond to the figure above.

Table S1.1 All significant OLEs, using common average reference (CAR):

Out of 112 tested electrodes (numbers 1-112) 69 electrodes showed significant OLEs earlier than 300 ms, 7 of which were marked as epileptic and 2 more were labeled as 'bad' due to other electrical artifacts (see methods). Electrodes are ordered chronologically by OLE from early to late:

Electrode number	Electrode label	OLE [ms]	Temporal error estimate [ms]
68	V1/V2d	50	4
34	IPS 0	59	2.5
67	V1	60	2

69	V2d	60	3.5
70	V2d/V3d	61	3
50		67	2.5
57		70	2
49		74	10
58		74	2.5
10		77	7.5
103		77	8.5
26		81	31
104		81	5.5
72	m-fus	83	2
73		84	4
102	Epileptic	85	5.5
101	Epileptic	87	6
77	p-fus, Bad	89	4
41		91	3.5
18		92	9
79		92	17.5
66	V2v/V1	95	3.5
110		95	25.5
111		96	23
25		98	7
33		98	3
84		99	24

107		99	23.5
108		99	38.5
42	Epileptic	101	29
109		102	26.5
105		103	20
100	Epileptic	105	49
53	Epileptic	107	19
55		107	6.5
97		109	4.5
82		110	19
78		120	18
76		124	5
62		126	31
59		129	3
11		134	13
52	Epileptic	137	8.5
71		138	3
83		142	63
60		143	10
87		143	11
63	Bad	153	13
30		167	22
44	Epileptic	167	30.5
81		167	16

9		169	17
19		169	7
65	V3v/V2v	170	10
99		170	4.5
86		172	8
94		177	25.5
92		185	26
39		190	92
74		192	22.5
93		192	19
54		200	9.5
12		210	7
98		211	12.5
106		216	13
75		227	37
112		232	93
61		242	34.5
80		264	29.5

Table S1.2 All significant OLEs, using current source density (CSD) reference:

Out of 64 tested electrodes (lateral grid electrodes 2 to 63, excluding 8,57 because they reside in corners (see methods), and occipital strip 66 to 69), 29 electrodes showed significant OLEs earlier than 300 ms, 5 of which were marked as epileptic and 1 more was labeled as 'bad' due to other electrical artifacts. Electrodes are ordered chronologically by OLE from early to late:

Electrode number	Electrode label	OLE [ms]	Temporal error estimate [ms]
68	V1/V2d	43	3.5
69	V2d	58	1.5
34	IPS 0	60	2.5
67	V1	60	2
50		67	3
42	epileptic	69	11
49		71	13.5
58		71	2
66	V2v/V1	76	30
10		80	13.5
59		82	18.5
55		83	7.5
26		92	13.5
41		99	10
53	epileptic	103	18
35	epileptic	104	14.5
33		112	13.5
19		118	16
63	bad	124	31
60		132	18.5
51		135	24
54		157	20

18		168	15
52	epileptic	171	26.5
62		194	7.5
61		208	28.5
12		211	11
43	epileptic	212	56.5
11		265	40

Table S1.3 All significant OLEs, using broadband gamma power:

Out of 112 tested electrodes (numbers 1-112), 25 electrodes showed significant OLEs earlier than 300 ms, 1 of which was marked as epileptic. Electrodes are ordered chronologically by OLE from early to late:

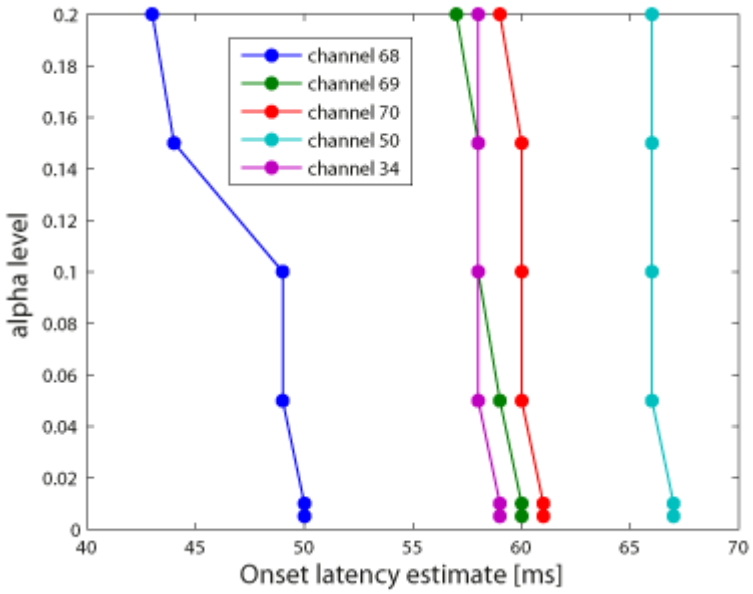
Electrode number	Electrode label	OLE [ms]	Temporal error estimate [ms]
68	V1/V2d	47	2
67	V1	64	5.5
69	V2d	67	3
70	V2d/V3d	67	2.5
57		71	4
50		86	3.5
49		87	15
33		103	14
34	IPS 0	103	8.5
72	m-fus	112	6.5
55		113	103.5

58		128	53.5
74		129	10
73		130	9
97		143	6.5
78		146	13
18		147	9
59		153	22.5
87		162	13
82		222	58.5
104		245	60.5
76		247	38.5
106		249	30.5
53	epileptic	274	74.5
81		303	11.5

2. Several thresholds analysis

Fig. S2 – Onset latency estimations (OLEs) are not affected much by varying the alpha level chosen.

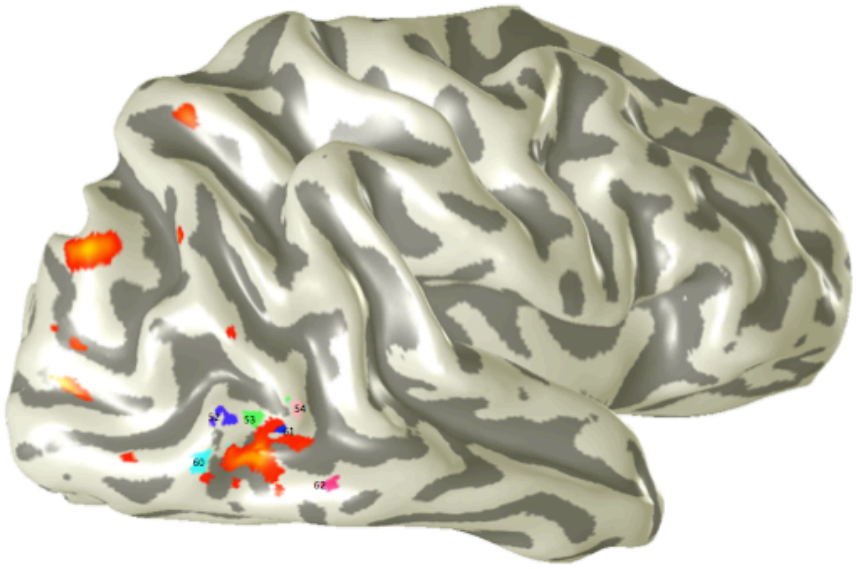
We ran the bootstrapping procedure for calculating response thresholds (see methods) several times using various alpha levels – 0.005, 0.01, 0.05, 0.1, 0.15, and 0.2, using 5000 permutations (results reported in the paper are for alpha level of 0.01 and 4000 permutations). We used the common average referenced (CAR) signals. OLEs were affected only slightly by the varying alpha level, such that the OLE tended to be earlier, as expected, for larger alpha levels. This demonstrated well that our OLEs are an upper-limit. In electrode 68, the earliest responding electrode, the OLE was particularly reduced when using an alpha level greater than 0.1. This was due to an early and small voltage deflection, which was marginally significant. Interestingly, in the CSD analysis, this early response became significant.



3. Motion localizer activation

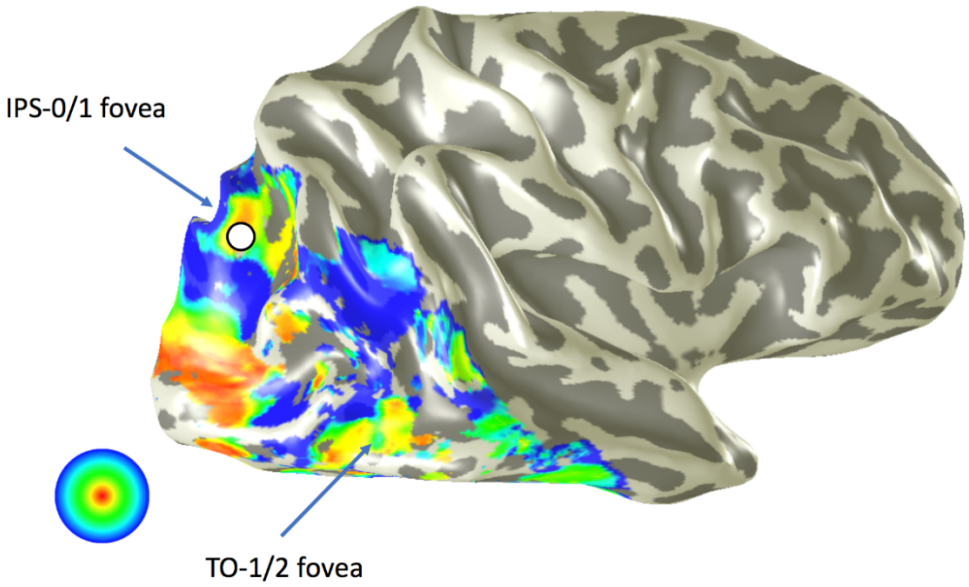
Figure S3A – BOLD activation contrasting moving versus static stimuli.

(Figure courtesy of Dr. Corentin Jacques)



BOLD activity for the contrast of expanding vs. static concentric circles, as in (Rauschecker et al., 2011)

Figure S3B –Retinotopic activations localizing area MT (Amano et al, 2009)**.**



4. Visual maps - retinotopy

Figure S4A – Electrode 34 over IPS0

The two main images show the smoothed (inflated) cortical surface of the right hemisphere, viewed from behind and the right side of the brain. The small inset indicates the location of the magnified views (black square). The color overlays show parameters from population receptive field model fits to a sweeping bar stimulus. Left - visual angle. Right – eccentricity. Electrode 34 (white disc with black outline) is located within the IPS-0 map, in the foveal confluence at the center of the IPS-0/1 cluster (Swisher et. al, 2007, Mackey, Winawer, Curtis, 2017). The diameter of the circle representing the electrode location is approximately 5 mm.

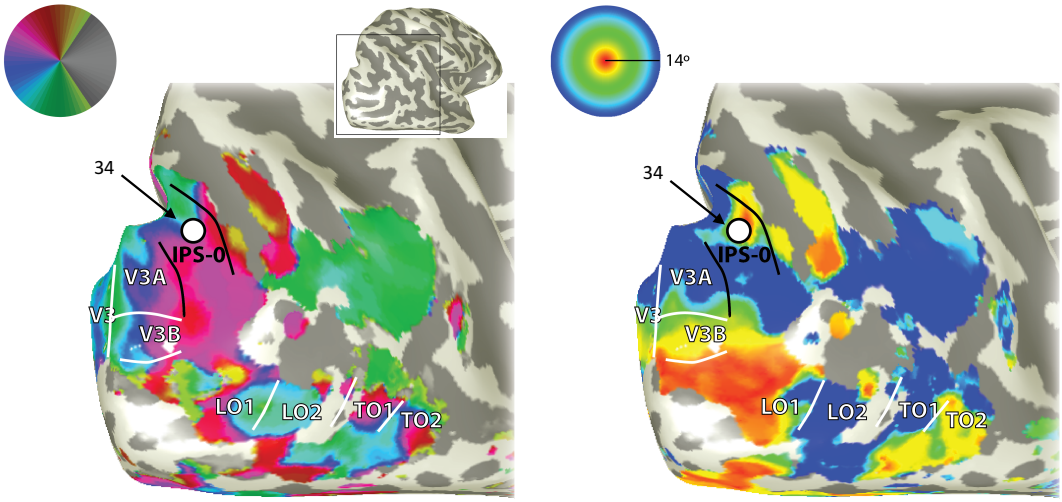
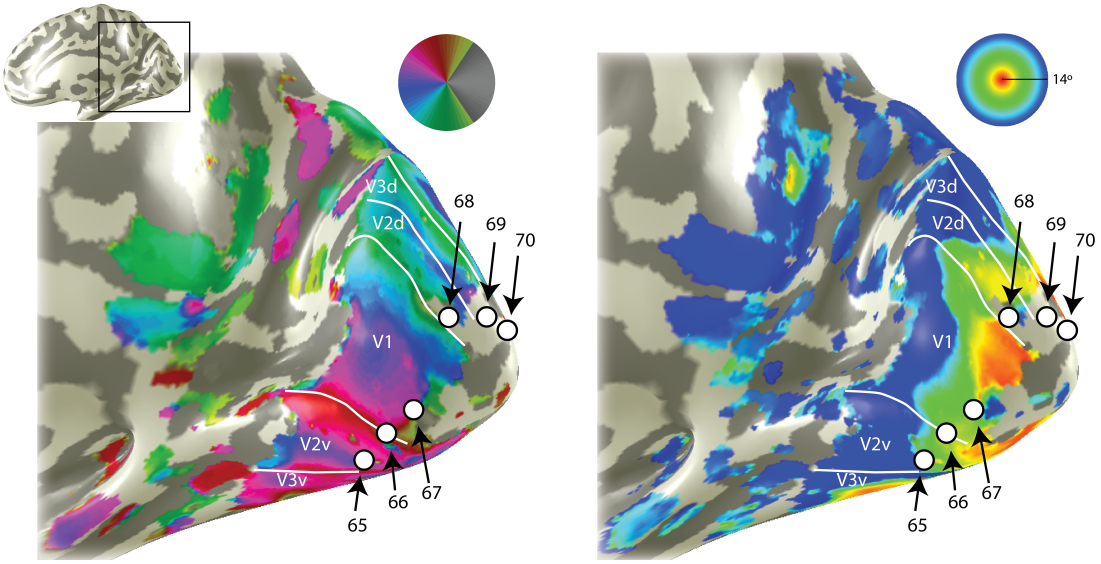


Figure S4B – Occipital electrodes over V1, V2, V3

Visual maps as in Fig. S4A, but from the medial view. Left - visual angle. Right – eccentricity. Electrodes 65-70 belong to a single occipital strip. They appear to be unequally spaced due to smoothing (inflation) of the cortical surfaces.



5. Electrode 34 is far from area V3-A

Since area V3-A is a relatively low-level visual area, we wanted to verify that the early visual onset measured in electrode 34, is not due to activity originating from area V3-A. For this reason, we marked areas V3-A, IPS-0 and IPS-1, as determined by retinotopic visual maps (see previous section), as well as electrode 34 on a volumetric brain image. As can be seen in Fig. S5, area IPS-0 (black) is closest to the electrode (red). Although the IPS-0 map borders V3-A, area V3-A (green) is far from electrode 34 (~1.5 cm). The electrode is increased in size for visibility, depicted as a 5-mm-diameter sphere. The center of the sphere is the location determined by the electrode localization procedure (see methods). We conclude that the early visual response in electrode 34 originates from area IPS-0.

Figure S5 – Volumetric localization of electrode 34

A volumetric image of the brain of patient 1. Red: electrode 34, black: IPS-0, white: IPS-1, Green: V3-A.