



Deriving TMS-evoked BOLD HRFs from multiple cortical areas at 3T



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Does the BOLD HRF response vary significantly across different cortical areas?

We applied transcranial magnetic stimulation (TMS) during fMRI over several brain regions to directly evoke responses.

"Button press runs"

- Visual cue = right thumb button press (20x per run)
- To evoke HRFs in somatosensory cortex
- Two separate runs to show variability of responses across time
- i.e. test-retest approach

"TMS runs"

- 20 single TMS pulses per run
- 110% of rMT intensity, scap-cortex distance corrected
- Single TMS pulse given during gap in functional volume acquisition



Methods

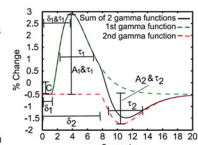
Targeted brain regions:



- Estimated response magnitudes at each voxel using GLM with sinusoidal basis functions

- F test identified significance

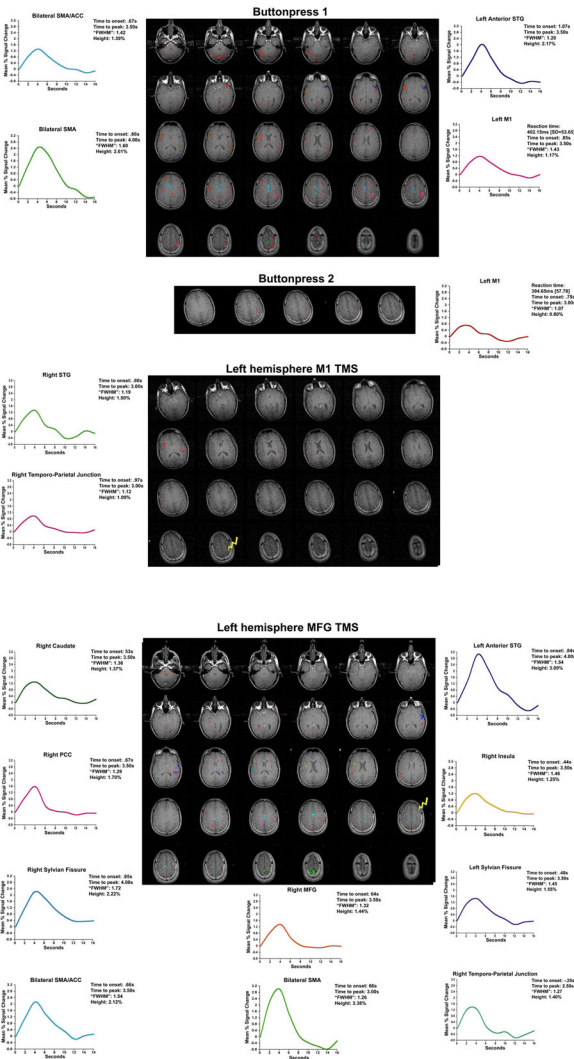
- Quantified the shape of evoked HRFs by fitting the sum of two gamma functions to the fMRI data



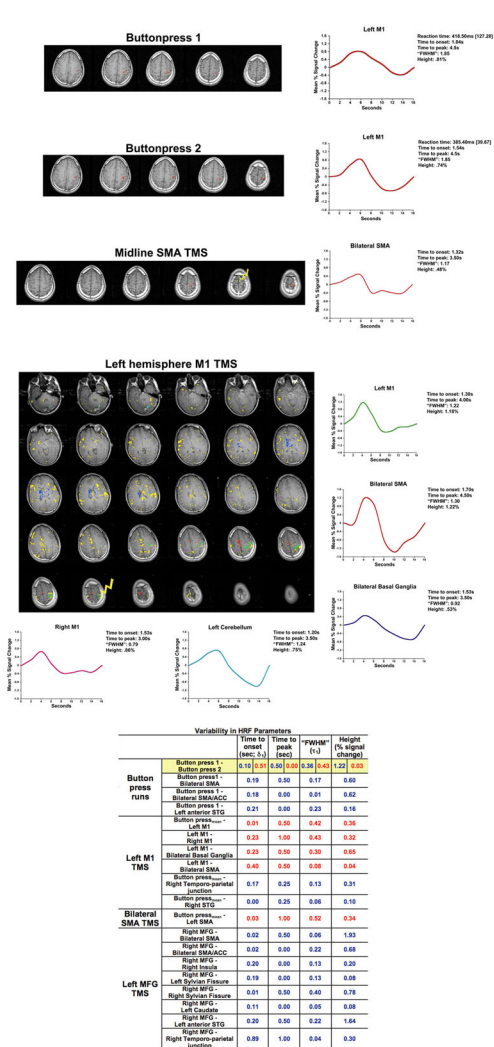
(Handwerker et al. NeuroImage 2004)

Results

Subject 1



Subject 2



	Variability in HRF Parameters					Height [% signal change]
	Button press 1 onset (sec)	Button press 1 peak (sec)	Button press 2 onset (sec)	Button press 2 peak (sec)	p-value	
Button press runs	Button press 1	0.16	0.81	0.81	0.81	0.81
	Button press 2	0.19	0.80	0.17	0.60	
	Bilateral SMA/ACC	0.18	0.80	0.81	0.82	
	Bilateral SMA	0.21	0.80	0.23	0.16	
Left M1 TMS	Left M1	0.01	0.49	0.42	0.36	
	Left M1	0.23	1.00	0.43	0.32	
	Bilateral Basal Ganglia	0.40	0.50	0.60	0.50	
	Left M1	0.07	0.25	0.13	0.31	
Bilateral SMA TMS	Right STG	0.09	0.25	0.08	0.10	
	Button press 1	0.03	1.00	0.82	0.34	
	Right MFG	0.02	0.50	0.06	1.93	
	Bilateral SMA	0.01	0.80	0.40	0.28	
Left MFG TMS	Bilateral SMA/ACC	0.02	0.09	0.22	0.68	
	Right MFG	0.20	0.80	0.13	0.20	
	Right hand area	0.01	0.80	0.40	0.28	
	Right Sylvian Fissure	0.19	0.80	0.13	0.88	
	Right MFG	0.01	0.80	0.40	0.28	
	Right Sylvian Fissure	0.11	0.80	0.05	0.88	
	Left Caudate	0.20	0.80	0.22	1.64	
	Right MFG	0.09	1.00	0.04	0.30	