SUPPLEMENTAL TABLES

Supp. Table 1: Description of all tasks used for analysis of fMRI task control signals. *Note: asterisks in the 'Task' column indicate pairs of studies using the same set of subjects. Pairs with the same subjects include tasks 1 and 2 (*); 3 and 15 (**); 4 and 16 (***); 11 and 12 (****).*

#	Task description	Publication (original)	Task design	Stimuli	Input modality	Output modality	N	Signals used
1	Abstract/ concrete (Auditory, 3T)*	Neta et al., 2014	Mixed block/ event-related	nouns	auditory	button	34	error/ambiguous/ correct timecourses; sustained Z-score; onset/offset cues
2	Rhyme/ non-rhyme*	Neta et al., 2014	Mixed block/ event-related	words	visual	button	34	error/ambiguous/ correct timecourses; sustained Z-score; onset/offset cues
3	Abstract/ concrete (Auditory, 1.5T)**	Dosenbach et al., 2006	Mixed block/ event-related	nouns	auditory	button	24	sustained Z-score
4	Abstract/ concrete (Visual)***	Dosenbach et al., 2006	Mixed block/ event-related	nouns	visual	button	17	sustained Z-score
5	Cross-modal attention	n/a	Mixed block/ event-related	words	auditory/ visual	button/ speech	32	sustained Z-score
6	Living/ Non-living	Dosenbach et al., 2006	Mixed block/ event-related	images	visual	button	34	sustained Z-score
7	Motor timing	Dosenbach et al., 2006	Mixed block/ event-related	tone patterns	auditory	button	32	sustained Z-score
8	Object naming	Dosenbach et al., 2006	Mixed block/ event-related	images	visual	speech	18	sustained Z-score
9	Noun/ verb	Dubis et al., 2014	Mixed block/ event-related	nouns/ verbs	visual	button	30	sustained Z-score
10	Sustained task load	n/a	Mixed block/ event-related	words/ images	auditory/ visual	button	28	sustained Z-score
11	Glass pattern (2-level)****	Dubis et al., 2016	Mixed block/ event-related	dot pairs	visual	button	20	sustained Z-score
12	Glass pattern (4-level)****	Dubis et al., 2016	Mixed block/ event-related	dot pairs	visual	button	20	sustained Z-score
13	Glass patterns (limited)	Dubis et al., 2016	Mixed block/ event-related	dot pairs	visual	button	30	sustained Z-score
14	Visual attention	n/a	Mixed block/ event-related	Gabor patches	visual	button	30	sustained Z-score
15	Visual search**	Dosenbach et al., 2006	Mixed block/ event-related	Gabor patches	visual	button	24	sustained Z-score
16	Upper/ Lower-case***	Dosenbach et al., 2006	Mixed block/ event-related	nouns	visual	button	17	sustained Z-score
17	Object identification	Ploran et al., 2007	Event-related (slow reveal)	object images (gradual dissolve)	visual	button	13	slow reveal timecourses
18	Word identification	n/a	Event-related (slow reveal)	words (gradual letter reveal)	visual	button	13	slow reveal timecourses

19	Object priming	n/a	Event-related (slow reveal)	object images (gradual dissolve)	visual	button	24	slow reveal timecourses
20	Object retrieval	n/a	Event-related (slow reveal)	object images (gradual dissolve)	visual	button	26	slow reveal timecourses
21	Object shuffle	Ploran et al., 2011	Event-related (slow reveal)	object images (jittered mask)	visual	button	16	slow reveal timecourses
22	Resting state	Gordon et al., 2016	n/a	n/a	n/a	n/a	69	functional connectivity

Supp. Table 2: Description of MRI acquisition parameters for all tasks.

#	Name	TR (s)	Voxel size	Scanner strength
1	Abstract/concrete (Aud/3T)	2.5	4 x 4 x 4	3T
2	Rhyme/non-rhyme	2.5	4 x 4 x 4	3T
3	Abstract/concrete (Aud/1.5T)	2.5	3.75 x 3.75 x 8	1.5T
4	Abstract/concrete (Vis)	2.5	3.75 x 3.75 x 8	1.5T
5	Cross-modal attention	2.5	3.75 x 3.75 x 8	1.5T
6	Living/nonliving	2.5	3.75 x 3.75 x 8	1.5T
7	Motor timing	2.63	3.75 x 3.75 x 8	1.5T
8	Object naming	3.18	3.75 x 3.75 x 8	1.5T
9	Noun/verb	2.5	4 x 4 x 4	3T
10	Sustained task load	2.5	4 x 4 x 4	3T
11	Glass pattern errors (2-level)	2.5	4 x 4 x 4	3T
12	Glass pattern errors (4-level)	2.5	4 x 4 x 4	3T
13	Glass patterns (limited)	2.5	4 x 4 x 4	3T
14	Visual attention	2.5	4 x 4 x 4	3T
15	Visual search	2.5	3.75 x 3.75 x 8	1.5T
16	Upper/lowercase	2.5	3.75 x 3.75 x 8	1.5T
17	Object identification	2	3.2 x 3.2 x 3.2	3T
18	Word identification	2	3.2 x 3.2 x 3.2	3T
19	Object priming	2	4 x 4 x 4	3T
20	Object retrieval	2	4 x 4 x 4	3T
21	Object shuffle	2	3.2 x 3.2 x 3.2	3T
22	Resting state	2.5	3 x 3 x 3.5	3T

Supp. Table 3: All *Neurosynth* term associations for CO1 regions. *Note: Numbers assigned to CO region names correspond to the ordering of CO regions as in Dworetsky* et al.*, 2021; coordinates are displayed in MNI space. Italicized gray items represent the anatomically-related terms excluded from the word clouds in* ***Figure 6.***

CO6	CO5	CO15	CO11	CO14	CO13	CO12	CO4
7, 8, 51	**-3, 6, 53**	**36, 22, 3**	**-36, 20, 3**	**6, 22, 28**	**5, 20, 37**	**-1, 15, 44**	**-5, 18, 34**
supplementary	motor	*anterior insula*	*anterior insula*	*anterior cingulate*	*anterior cingulate*	task	pain
supplementary motor	*supplementary*	*insula*	*insula*	*cingulate*	*cingulate*	working memory	*cingulate*
pre sma	*supplementary motor*	task	*insular*	pain	*anterior*	working	*anterior cingulate*
motor	*premotor*	gain	*insula anterior*	*anterior*	*cingulate cortex*	tasks	*anterior*
premotor	tasks	*insular*	*anterior insular*	*cingulate cortex*	pain	*parietal cortex*	*cingulate cortex*
task	task	*anterior insular*	gain	*insula*	*acc*	*pre sma*	*anterior insula*
pre supplementary	*premotor cortex*	*anterior*	pain	*anterior insula*	*dorsal anterior*	*frontal*	*insula*
motor pre	*pre sma*	mood	*anterior*	*acc*	gain	*medial frontal*	*acc*
eye fields	complexity	tasks	painful	*insula anterior*	painful	performance	painful
movements	preparation	*insula anterior*	*inferior frontal*	*dorsal anterior*	*anterior insula*	conflict	*dorsal anterior*
tasks	working	working memory	*frontal*	*cortex acc*	*cortex acc*	*anterior cingulate*	noxious
cortex supplementary	execution	working	*anterior cingulate*	experiencing	task	verbal	*supplementary*
motor imagery	working memory	calculation	*insular cortex*	*dacc*	conflict	demands	*supplementary motor*
premotor cortex	*parietal*	*insular cortex*	*inferior frontal*	*salience network*	monitoring	mood	*cortex supplementary*
control	load	short term	load	competition	inhibit	*parietal*	*cortex acc*
primary motor	*frontal*	*anterior cingulate*	*acc*	painful	executive	*frontal cortex*	mood
eye	*motor sma*	demands	*cortex anterior*	gain	noxious	*acc*	*insula anterior*
execution	*motor pre*	pain	mood	risk taking	oddball	memory	*midbrain*
parietal	production	maintenance	task	sustained attention	effortful	gain	
motor cortex	*motor cortex*	*intraparietal sulcus*	*ifg*	regulatory	error	memory task	
motor sma	reading	painful	*medial frontal*	*anterior insular*	mood	phonological	

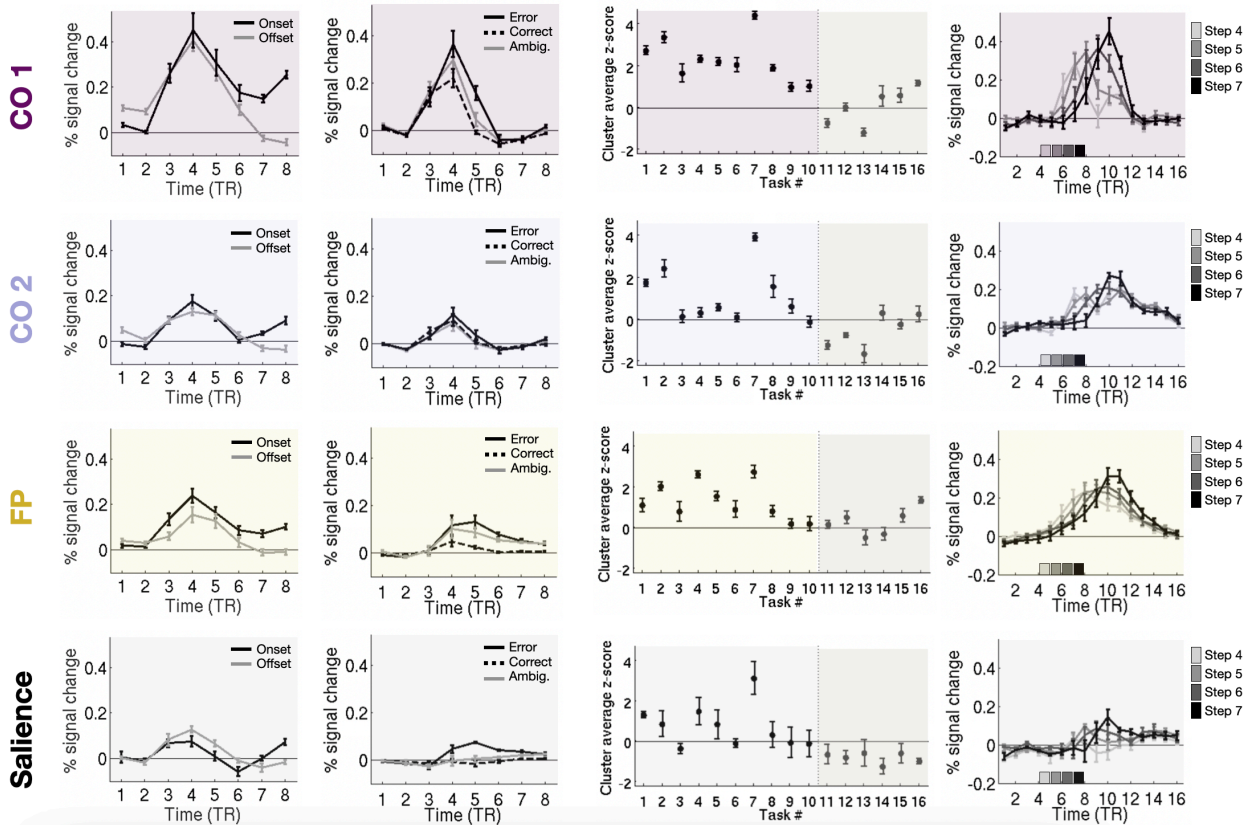
fronto parietal	demands	difficulty	interference	empathic	*dorsolateral prefrontal*	memory wm
frontal	eye fields	*intraparietal*	*frontal gyrus*	conflict	inhibition	verbal fluency
anterior insula	language	*pre sma*	*insula inferior*	executive	*insula*	monitoring
	words	modality	*gyrus ifg*	noxious	frontal eye	word
	finger	load	demands	*somatosensory cortices*	stroop	*cingulate*
	primary motor	orthographic	*broca*	somatosensory	attentional	*cortex acc*
	motor imagery	risk taking	*cingulate*		*dorsolateral*	english
	phonological	cognitive control	tasks		working	*cingulate cortex*
	sequence	*dorsolateral*	nociceptive		working memory	ptsd
	abstract	phonological	*prefrontal*		*supplementary*	calculation
	dorsal premotor	*frontal*			*prefrontal*	task difficulty
	words	*secondary somatosensory*				*anterior*
	movement	*parietal*				motor
	generation	*prefrontal*				
	interference					
	lexical					
	cerebellum					
	orthographic					
	speech production					
	finger movements					
	verb					
	action					
	pre supplementary					
	frontal eye					
	preparatory					
	movements					

Supp. Table 4: All *Neurosynth* term associations for CO2 regions. *Note: Numbers assigned to CO region names correspond to the ordering of CO regions as in Dworetsky* et al.*, 2021; coordinates are displayed in MNI space. Italicized gray items represent the anatomically-related terms excluded from the word clouds in* ***Figure 6.***

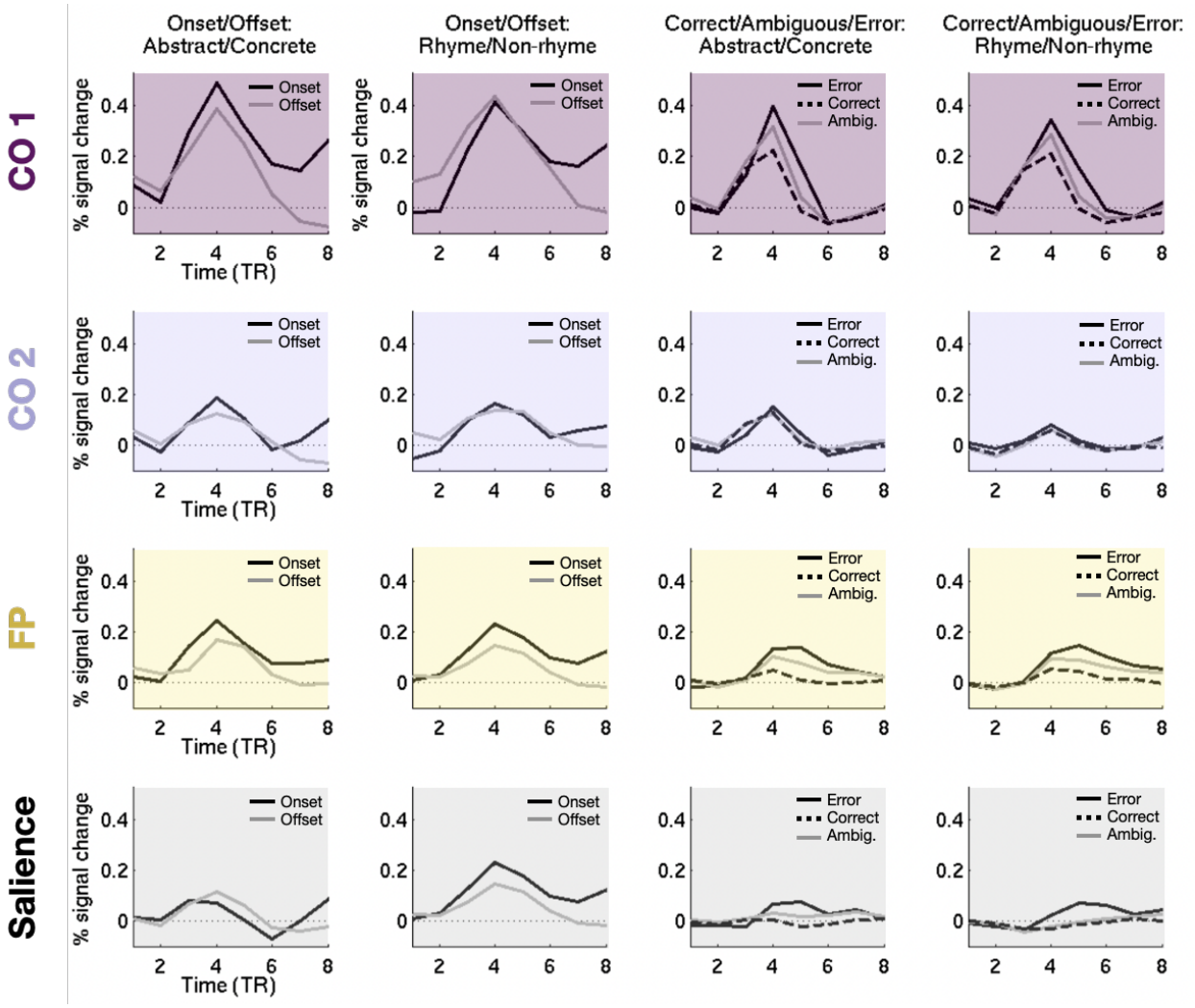
CO8	CO9	CO7	CO3	CO2	CO1
37, 4, -4	**49, 8, -1**	**36, 10, 1**	**-34, 3, 4**	**-45, 3, 9**	**-51, 8, -2**
insula	*insula*	*insula*	*insula*	motor	motor
posterior insula	motor	*anterior insula*	pain	*insula*	*premotor*
noxious	painful	*insular*	painful	muscle	imagery
painful	*supplementary motor*	*putamen*	*insular*	pain	phonological
pain	painful	pain	nociceptive	*primary motor*	*supplementary motor*
taste	*supplementary*	noxious	*putamen*	movement	motor imagery
insular	*operculum*	painful	*posterior insula*	*motor sma*	*somatosensory cortices*
anterior insula	externally	sensation	somatosensory	*supplementary motor*	*supplementary*
insular cortex	*insula anterior*	*caudate nucleus*	*anterior insula*	*supplementary*	*premotor cortex*
putamen	force	*posterior insula*	affective	*motor network*	finger
sensations	*sensorimotor cortex*	*cingulate*	*insular cortex*	*motor cortex*	*insula*
somatosensory cortices	*motor sma*	*anterior*	*basal ganglia*	finger tapping	visual word
autonomic	*cerebellum*	*insular cortex*	*ganglia*	*m1*	*primary motor*
orbitofrontal	*posterior insula*	*caudate*	*basal*	*premotor*	movement
secondary somatosensory	movement	*nucleus*	*somatosensory cortex*	finger	coordination
	anterior insular	*primary*	motor	painful	motor task
	primary motor	*primary secondary*	*primary*	finger movements	somatosensory
	anterior insula	arousal	interoceptive	*putamen*	*motor cortex*
	motor performance	risk taking	*secondary somatosensory*	autonomic	speaking
	insular	autonomic	*insula anterior*	noxious	*anterior superior*
	thalamus	*anterior cingulate*	force	movements	*hemisphere*
	finger	*secondary somatosensory*	*primary motor*	electrical	production
	insula cortex	*insula anterior*	*contralateral*	*ventral premotor*	movements
	anterior	*striatum*	*limbic*	*premotor cortex*	word form
	primary	*orbitofrontal*	intensity	*subcortical*	speech
	noxious		*anterior insular*	tapping	painful
	premotor		*primary somatosensory*	*cortex m1*	*ipsilateral*
	somatosensory		*thalamus*	*thalamus*	*primary*
			striatal	aphasia	*contralateral*
			amygdala	*secondary somatosensory*	*cerebellum*

	stimulation	arm	speech production
	somatosensory cortices	imitation	language
	supplementary motor	execution	
		cerebellum	
		force	
		motor imagery	
		somatosensory cortices	
		hand	
		somatosensory	
		primary	
		ipsilateral	
		sensorimotor cortex	

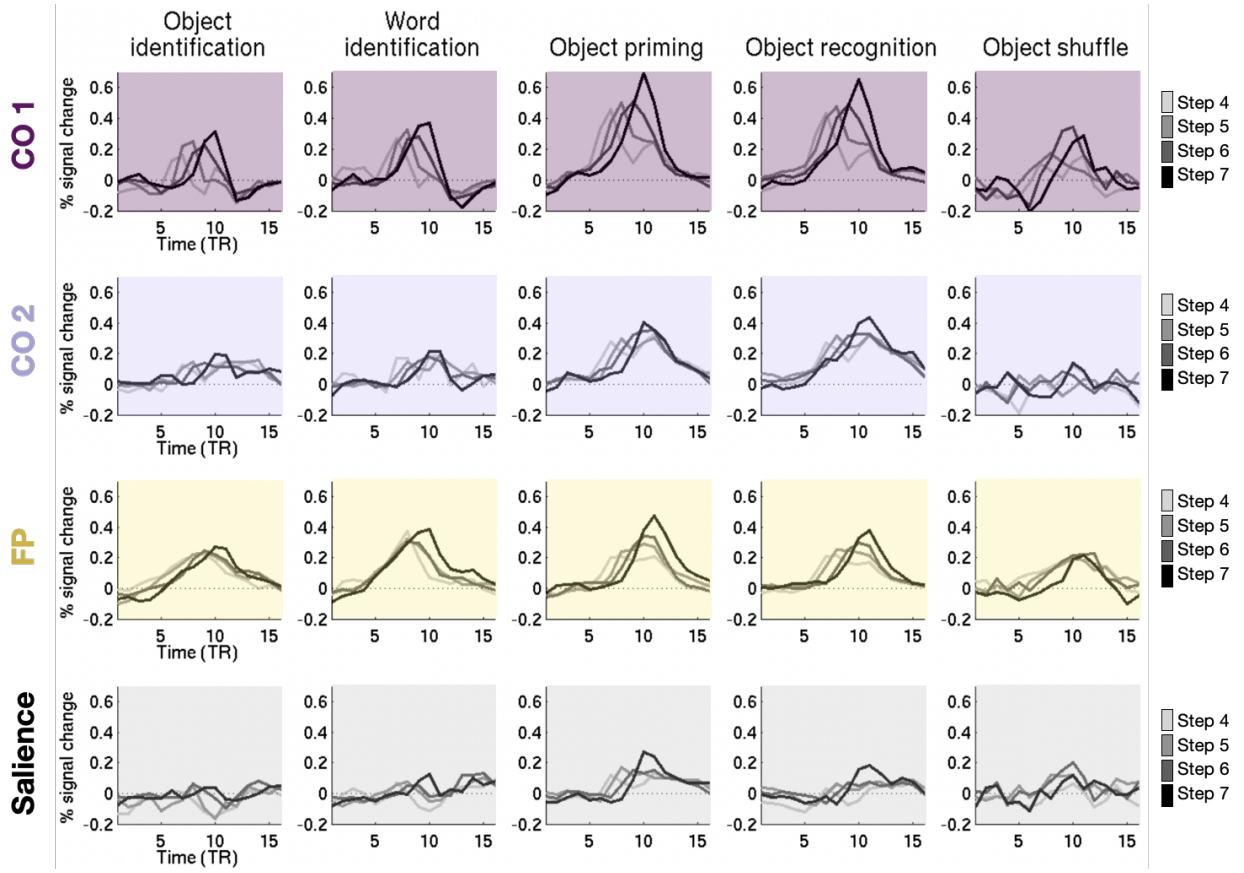
SUPPLEMENTAL FIGURES



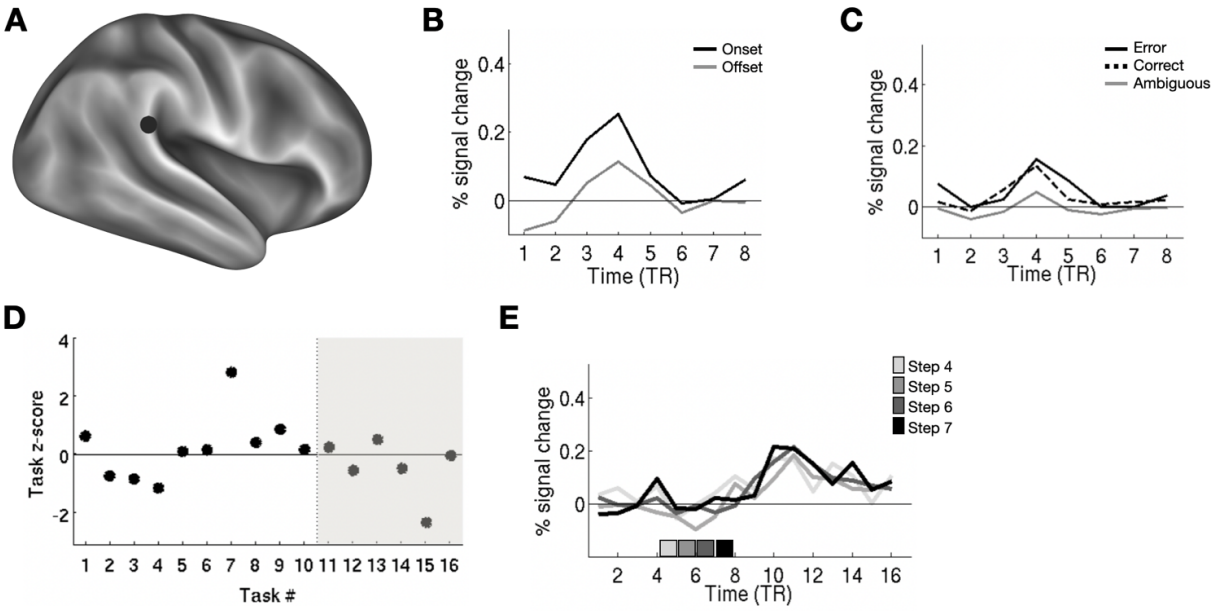
Supp. Fig. 1: All signals by network cluster. Task control signals (columns) are shown separated by network (rows). The plot includes signals from task initiation (onset and offset cues), task adjustment (responses to ambiguous stimuli, error, and during decision making contexts), and sustained task signals. The CO1 and CO2 clusters differ in these signals relative to each other and other large-scale networks including the frontoparietal (FP) and salience network. The CO1 sub-system shows the strongest task control characteristics of all three types.



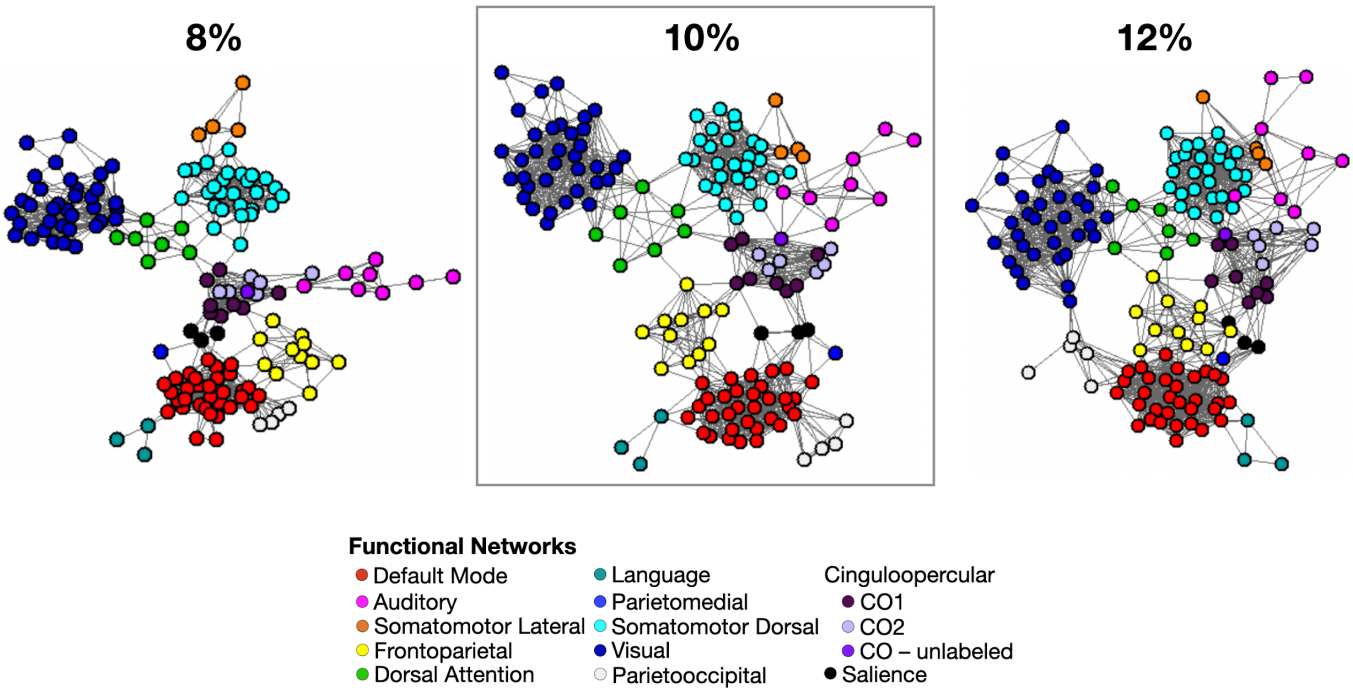
Supp. Fig. 2: Control signals per task. Timecourses related to task set initiation (onset/offset) and performance adjustment (correct/ambiguous/error), are shown separated by network (rows) and tasks (columns) . The two CO sub-systems are shown separately (CO1 in dark purple, CO2 in light purple) as are responses from the frontoparietal (FP) and salience networks. As can be seen, control-related responses were most robust in CO1, with strong onset and offset responses, and differences between error and ambiguous trials vs. correct; these characteristics replicated across tasks. The CO1, frontoparietal, and salience network responses for these signals were more modest, also replicating across tasks



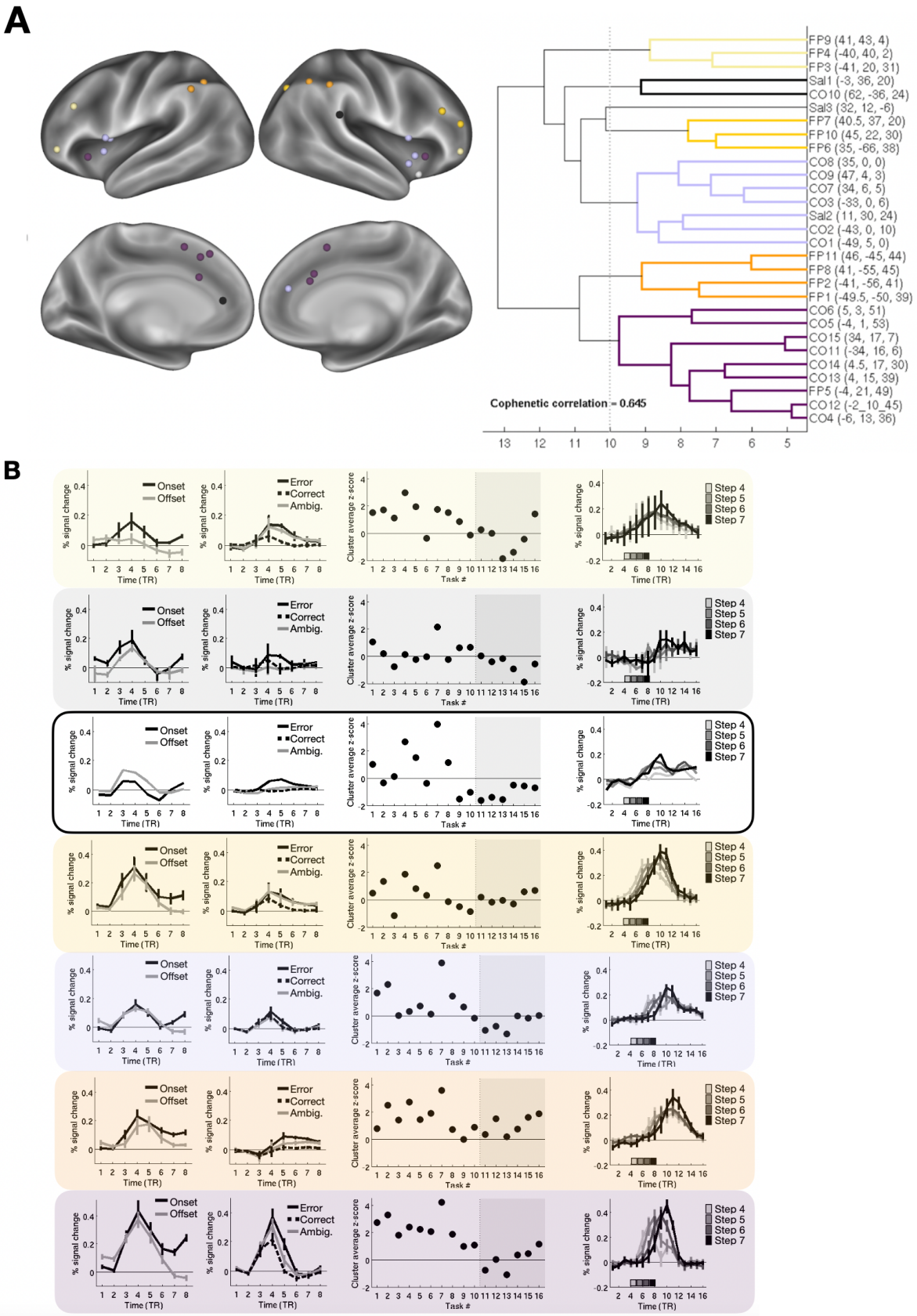
Supp. Fig 3: Slow reveal task signals by task. Timecourses for the slow-reveal decision making task are shown separated by network (rows) and tasks (columns). In each task, the CO1 and CO2 clusters looked clearly distinct from one another. The CO1 cluster had transient responses associated with the moment of decision across all tasks, although with variability in their magnitude. The frontoparietal cluster had early onset and graded responses peaking around the moment of decision in most tasks. The CO2 and salience clusters had dampened and more variable responses across tasks.



Supp. Fig. 4: Task signals for CO region #10, which did not distinctly cluster with the CO1 or CO2 regions. **(A)** Location on the brain, in black; **(B)** Onset vs. offset timecourses; **(C)** Correct vs. error vs. ambiguous trial timecourses; **(D)** Sustained task z-scores; **(E)** Slow reveal task timecourses.This region had relatively weak onset and offset cues, and weak responses to correct trials and errors (as in CO2). Ambiguous stimulus responses were below the level seen for correct trials. Sustained signals were very low or negative for all but one task (below the levels seen for either CO1 or CO2), and decision-making responses were weak, noisy, and ungraded regardless of the moment of decision. Thus, this outlier region did not demonstrate evidence of task control activity.



Supp. Fig. 5: Spring-embedded plots depicting the relationship among high consensus regions from across the whole brain, similar to that shown in **Fig. 5**. Here, we show spring embedding plots at 8% and 12% edge densities as well as the 10% edge density shown in the main text. In all cases, the CO network regions (purples) cluster together relative to regions in other networks. The CO1 sub-system is positioned closer to other putative control networks (e.g., frontoparietal, salience) relative to the CO2 sub-system.


A
FP9 (41, 43, 4)
FP4 (-40, 40, 2)
FP3 (-41, 20, 31)
Sal1 (-3, 36, 20)
CO10 (62, -36, 24)
Sal3 (32, 12, -6)
FP7 (40.5, 37, 20)
FP10 (45, 22, 30)
FP6 (35, -66, 38)
CO8 (35, 0, 0)
CO9 (47, 4, 3)
CO7 (34, 6, 5)
CO3 (-33, 0, 6)
Sal2 (11, 30, 24)
CO2 (-43, 0, 10)
CO1 (-49, 5, 0)
FP11 (46, -45, 44)
FP8 (41, -55, 45)
FP2 (-41, -56, 41)
FP1 (-49.5, -50, 39)
CO6 (5, 3, 51)
CO5 (-4, 1, 53)
CO15 (34, 17, 7)
CO11 (-34, 16, 6)
CO14 (4.5, 17, 30)
CO13 (4, 15, 39)
FP5 (-4, 21, 49)
CO12 (-2_10_45)
CO4 (-6, 13, 36)
Cophenetic correlation = 0.645
13 12 11 10 9 8 7 6 5
B
Onset
Offset
Error
Correct
Ambig.
Step 4
Step 5
Step 6
Step 7
% signal change
Time (TR)
Cluster average z-score
Task #

Supp. Fig. 6: Hierarchical analysis is repeated with regions from all 3 networks. **(A)** Hierarchical clustering of frontoparietal (FP), salience (Sal), and cingulo-opercular (CO) regions based on task control signals, as in **Fig. 2**. Regions are shown on the left, colored by their clusters, shown on the right. **(B)** Control signals for each cluster, shown with the same cluster colors. As can be seen, similar CO1 and CO2 clusters are identified even within this broader set of regions. When the frontoparietal and salience regions are included, one frontoparietal region (FP5) is included in the CO1 cluster and one Salience region (Sal2) is included in the CO2 cluster. The remaining FP regions cluster into three distinct sub-systems (light yellow, marigold, and orange). The remaining Salience regions are included in the black cluster or singly. The remaining FP regions separate into 3 major sub-systems (FP1 in light yellow, FP2 in marigold, and FP3 in orange). The FP3 cluster (with several regions along the inferior parietal lobule) shows the strongest control-related response characteristics, most closely clustered with CO1; however, in this group, cueing responses and especially responses to error, correct, and ambiguous are diminished relative to CO1. The FP2 cluster (with regions along lateral prefrontal cortex) has an intermediate profile, with strong cueing and decision-making responses, modest/weak sustained responses, and weak (but differentiable) responses to errors and ambiguous signals relative to correct trials. The remaining salience region couples with the single supramarginal gyrus CO region and shows a similar profile shown in **Supp. Fig. 3**. Thus, there are clear differences in control task responses across these three networks, although these differences appear more subtle than what is seen in the functional connectivity data.