

Neural Correlates of Cognitive Processes

LIDA Module or Function	Cognitive Processes	Neural Correlates Include	Supporting References
Sensory Motor Automatism	Sensory Motor Automatism	Cerebelum	Pijpers et al 2006
	Sensory Memory	Temporal-prefrontal (echoic)	Alain et al, 1998
Slipnet	Perceptual Associative Memory (PAM)	Perirhinal Cortex	Davachi et al 2003 Freeman, 2003
Slipnet object nodes	PAM-Visual object recognition	Inferotemporal cortex (IT) Perirhinal cortex	Tanaka, 1996 Logothetis & Sheinberg 1996 Winters & Bussey 2005
Slipnet	PAM-phenomenal visual experience	Medial temporal lobe	Kreiman, Fried, and Koch 2002
Slipnet	PAM-Categorization-sensory	Sensory neocortex	Keri 2004
Slipnet	PAM-Categorization-abstract	Lateral & anterior prefrontal structures	Keri 2004
Slipnet	PAM-Categorization-motion	lateral intraparietal	Freedman and Assad. 2006
Slipnet	Top down processing		Hansen et al 2006
Slipnet face nodes	PAM-Visual face recognition	Inferotemporal cortex (IT)	Afraz, Kiani, and H. Esteky 2006
Slipnet face & other object nodes	PAM-Recognition of faces & other objects	Fusiform face area	Grill-Spector, Sayres and Ress 2006 Kanwisher and Yovel 2006
Slipnet parts of face objects	PAM-spatial visual & tactile map-objects near or touching face	Superior postcentral sulcus of the parietal cortex	Sereno and Huang 2006
Slipnet olfaction and emotion nodes	PAM-Olfactory reward & punishment signals	Mushroom body neurons & dorsal paired medial neurons	Keene et al. 2006.
Slipnet emotion nodes	PAM-Emotions	amygdala and orbito-frontal cortex)	Taylor & Fragopanagos 2005

Comment : The case of HM show that the MTL is not necessary for phenomenal visual perception

Comment : Applies to fruit fly but not necessarily to mammalian structure

Slipnet	PAM-emotion affecting learning	basolateral amygdala, perirhinal cortex, entorhinal cortex	Paz et al 2006
Slipnet fear nodes	PAM-Memory of fear	Lateral nucleus of the amygdala	Schafe et al 2005
Slipnet novelty node	PAM-Novelty	substantia nigra/ventral tegmental area	Bunzeck 2006
Slipnet action situation nodes	PAM-Recognize action situation – e.g eating a peanut	Mirror neurons in the <i>perisylvian</i> cortical region	Iacoboni, in press
Slipnet reward nodes	PAM-Reward for action or its avoidance	medial orbitofrontal cortex	Kim, Shimojo & Doherty. 2006
Slipnet reward nodes	PAM-Stimulus-reward associations	orbitofrontal cortex/ventral striatum	Keri 2004
Slipnet emotion nodes	PAM-Romantic love	brainstem right ventral tegmental area and right postero-dorsal body of the caudate nucleus	Fisher, H. E., A. Aron, and L. L. Brown. 2006
Slipnet self movement nodes & place nodes	PAM-Self movement input to location – cognitive map	entorhinal cortex hippocampus	McNaughton et al, 2006
Slipnet category nodes	Perceptual learning of concepts	hippocampus	Lin et al 2007
Slipnet feeling nodes	Feelings, bodily states, social emotions	Insula	Singer 2007
Workspace	Preconscious Working Memory Buffers	Temporo-parietal and frontal lobes	Baddeley, 2001
Workspace	Working Memory	Prefrontal and (left) parietal	Markowitsch 2000
Workspace	Working Memory	left frontopolar cortex, left mid-ventrolateral PFC, left mid-dorsolateral PFC & dorsal anterior	Nyberg, et al 2003

Comment: Search PubMed for preconscious, preattentive, preperceptual

		cingulate cortex	
Sparse distributed memory	Transient Episodic Memory	Hippocampal System	Squire 1992; Panksepp, 1998 p.129; Shastri, 2001; Shastri, 2002; Metcalfe & Jacobs 1996; Olton, Becker and Handelman 1979; Ferbinteanu and Shapiro 2003
Sparse distributed memory	Perceptual binding for transient episodic memory	intra-parietal sulcus	Uncapher, Otten, and Rugg. 2006
Sparse distributed memory	Declarative Memory	Widely distributed neocortical areas, especially the frontal, lateral temporal, and occipital lobes	Squire, 1992 Bayley et al 2005
Sparse Distributed Memory with "I don't care"	Declarative Memory	Limbic structures and prefrontal cortex	Markowitsch 2000
	Semantic memory (or maybe perceptual)	Left frontopolar cortex, left mid-ventrolateral PFC, left mid-dorsolateral PFC and dorsal anterior cingulate cortex	Nyberg, et al 2003
	Episodic memory (transient or long term?)	left frontopolar cortex, left mid-ventrolateral PFC, left mid-dorsolateral PFC and dorsal anterior cingulate cortex	Nyberg, et al 2003
	Consolidation	Hippocampus & neocortex Hippocampus & medial frontal cortex	Paz et al 2006 Hahn, Sakmann, and Mehta. 2006 Euston, Tatsuno, and McNaughton. 2007
Workspace	Deliberation (imagination)	Hippocampus	Hassabis et al 2007

Working memory	Binding of visual and spatial information	large-scale theta phase synchronization between bilateral frontal regions and between the left frontal and right temporal-parietal regions	Wu et al 2007
Consciousness module	Consciousness	Gamma coherence Right superior parietal	Meador et al 2002 Newman et al 2003
Consciousness module – global workspace	Executive function	anterior cingulate cortex	Bush, Luu, & Posner. 2000
Consciousness module	Visual conscious perception	Parieto-frontal activity	Dehaene et al 2006
Consciousness	subjective contents of visual awareness	primary visual cortex and ventral visual areas, plus parietal and frontal activity	Rees 2007
Attention codelets	Attention to objects	posterior parietal cortex	Shomstein & Behrmann. 2006
Attention codelets	Higher visual scene processing	Frontal eye fields	Kaysera & Logothetis 2006
Global workspace	Global broadcast	long-distance synchronization of gamma oscillations	Melloni et al 2007
Schemenet	Procedural learning	striatum	Foerde et al 2006
Schemenet	Procedural memory	Basal ganglia, cortical motor regions, cerebellar structures	Markowitsch 2000
PL attention codelets	Procedural learning	corticostriatal synapses	Pittenger et al 2006
Scheme net	Procedural learning	Ventral striatum	Atallah et al 2006
Scheme net	Procedural Memory	Anterior cingulate cortex Striatum	Kennerley et al 2006 Pittenger et al 2006
Behavior net	Action selection	Prefrontal cortex	Newman et al 2003

Behavior net	Action selection	Striatum, basal ganglia	Pasquereau et al 2007
	Decision making	Basal forebrain	Pessiglione et al 2007
Slipnet Behavior net	Emotions modulating action selection	Amygdala, Orbital and medial prefrontal cortex	De Martino et al 2006
	Sensory-motor memory	Cerebellum	Smith & Shadmehr 2005
	Sensory-motor actions - saccades	Frontal eye field	Thompson et al 1996
	Sensory-motor control of balance and navigation	Semicircular canals	Fitzpatrick et al 2006
	Sensory-motor - innate behaviors	command chemical-central peptidergic ensembles	Kim et al 2006
Preaffference	Visual stability	mediodorsal thalamic nucleus	Sommer & Wurtz. 2006
Sensory-motor memory	Action execution	Dorsal striatum	Atallah et al 2006
	Motor representations of sequential procedures	Right intraparietal sulcus	Frey and Gerry 2006
Cognitive cycle	Cognitive cycle	Few hundred ms	Sigman & Dehaene. 2006
Cognitive cycle	Cognitive cycle	200-300 ms	Uchida et al 2006 van Berkum, J.J.A. 2006 Massimini et al, 2005 Willis & Todorov 2006
Cognitive cycle	Cognitive cycle	Coupled theta-gamma rhythms	Jensen & Colgin 2007 Canolty et al 2006
Cognitive cycle	EEG microstate		Koenig et al 2002 Koenig, Kochi, and Lehmann 1998 Lehmann et al 1998
	Automization	Basal ganglia, cerebellum	
	Reflexive decision making	amygdala, basal ganglia,	Satpute and Lieberman. 2006

Comment : Check whether this is only for voluntary saccades.

Comment : More input than control

Comment : Check PubMed for evoked potential, event related potential, ERP

Comment : Not really about the existence of cognitive cycles

Comment : Direct evidence for the conscious broadcast.

		ventromedial prefrontal cortex, dorsal anterior cingulate cortex, lateral temporal cortex.	
	Reflective decision making	lateral prefrontal cortex, posterior parietal cortex, medial prefrontal cortex, rostral anterior cingulate cortex, and hippocampus and surrounding medial temporal lobe region	Satpute and Lieberman. 2006
	Emotions in moral decision making	ventromedial prefrontal cortex	Koenigs et al 2007

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