Windows to the Brain:  
Coronal Anatomy 1  
Prefrontal-Subcortical Circuits  
Cortical Association Tracts

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Rightsideofeachsection: Major cortical association tracts are labeled and color-coded to match the figure below. *

**Major Long Cortical Association Tracts**

- Cingulum
- Superior longitudinal
- Inferior fronto-occipital
- Uncinate
- Inferior longitudinal

**Brief guide to neuropsychiatric symptoms associated with injury to tract.**

**Superior fronto-occipital (subcallosal) fasciculus**
- Anatomical connections: Orbital & medial prefrontal cortex ↔ Parietal cortex
- Clinical relevance: Akinetic mutism; disordered initiation & preparation of speech movements; transcortical motor aphasia; anomia & reduction of spontaneous speech with normal articulation

**Cingulum - short fibers**
- Anatomical connections: Cingulate cortex ↔ Frontal, parietal, occipital & temporal cortex
- Clinical relevance: Anterior - lack of emotional affective response to pain; anxiety; OCD; depression; panic; akinetic mutism

**Cingulum - long fibers**
- Anatomical connections: Frontal cortex ↔ Temporal cortex
- Clinical relevance: Posterior - impaired integration of visuospatial & memory processing

**Superior longitudinal (arcuate) fasciculus**
- Anatomical connections: Frontal cortex ↔ Parietal, occipital & temporal cortex
- Clinical relevance: R - left hemispatial neglect; L - conduction aphasia (fluent aphasia with impaired repetition, mostly preserved language comprehension); ideational apraxia (can’t carry out skilled movements and/or commands); depression; speech arrest; anomia; Posterior - transcortical sensory aphasia (impaired auditory comprehension, intact repetition & fluent speech)

**Uncinate fasciculus**
- Anatomical connections: Orbital & polar prefrontal cortex ↔ Anterior temporal cortex
- Clinical relevance: Deficits in retrieval of past information: R - episodic context-dependent memory, personal experiences, autobiographical; L - context-free memory, general knowledge of facts

**Inferior fronto-occipital fasciculus**
- Anatomical connections: Ventrolateral & dorsolateral prefrontal cortex ↔ Posterior temporal & occipital cortex
- Clinical relevance: R > L - impaired orienting of attention; visual recognition abnormalities; R + L - impaired pursuit eye movements; inaccurate reaching under visual guidance; impaired motion perception; R or R + L - impaired seeing/selecting in crowds; impaired spatial relations; visual agnosia & poor visual memory; impaired recognition of places & directions to get there; getting lost

**Inferior longitudinal fasciculus**
- Anatomical connections: Temporal pole ↔ Occipital cortex
- Clinical relevance: Disorders in recognition (visual agnosia) impaired visual recent memory; R or R + L - impaired face recognition (prosagnosia), visual object agnosia, visual hypoemotionality if cue presented visually; R + L or L > R - contralateral deficit in color vision (hemiachromatopsia); L-bilateral misnaming of objects presented by touch (tactoverbaldysfunction)

Left side of each section: Tracts involved in major prefrontal cortical-subcortical circuits and major subcortical structures are labeled and color-coded to match the figures below.*

Major Prefrontal - Subcortical Circuits
In psychiatry, the prefrontal cortex is generally divided into three principal areas. Each area has reciprocal connections with subcortical structures that form cortico-subcortical circuits.

**Dorsolateral circuit**
- Mediates executive functions such as organization, planning & attention

**Orbitofrontal circuit**
- Mediates socially appropriate behavior, impulse control & empathy

**Anterior cingulate circuit**
- Produces motivation by balancing the inhibitory input of the supplemental motor area with its own stimulus that supports wakefulness & arousal


Major Subcortical Structures
This cartoon of a lateral view of the brain and skull shows the approximate positions and configurations of the major subcortical structures. The colors assigned in this figure are used in the sectional atlas to facilitate structure identification.*

Major Prefrontal-Subcortical Circuits

Dorsolateral
Anterior Cingulate
Orbitofrontal

Major Cortical Association Tracts

cingulum
superior fronto-occipital
inferior fronto-occipital
uncinate
superior longitudinal
inferior longitudinal
Major Prefrontal-Subcortical Circuits

Dorsolateral
Anterior Cingulate
Orbitofrontal

Major Cortical Association Tracts

cingulum
superior fronto-occipital
inferior fronto-occipital
uncinate
superior longitudinal
inferior longitudinal

lateral ventricle
Major Prefrontal-Subcortical Circuits

- Dorsolateral
- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts

- Cingulum
- Superior fronto-occipital
- Inferior fronto-occipital
- Uncinate
- Superior longitudinal
- Inferior longitudinal

Structures:

- Caudate
- Putamen
- Insula
- Ventral striatum
- Lateral ventricle
Major Prefrontal-Subcortical Circuits

- Dorsolateral
- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts

- Cingulum
- Superior fronto-occipital
- Inferior fronto-occipital
- Uncinate
- Superior longitudinal
- Inferior longitudinal

Structures:

- Fornix
- Thalamus
- Caudate
- Putamen
- Globus pallidus
- Insula
- Amygdala
- Hippocampus
- Substantia nigra
- Mammillary body
- Hypothalamus

Lateral ventricle

3rd ventricle
Major Prefrontal-Subcortical Circuits

- Dorsolateral
- Anterior Cingulate
- Orbitofrontal

Major Cortical Association Tracts
- cingulum
- superior fronto-occipital
- inferior fronto-occipital
- uncinate
- superior longitudinal
- inferior longitudinal

lateral ventricle