In psychosis.

- Decrease volume frontal, parietal, hippocampus, corpus collosum.
- Increase CSF volume
- Functional regions noted for:
  - Hallucinations.
- Decreased recruitment amygdala when shown emotionally distressing stimuli
Top panel: (a) voxel-based morphometry (VBM) findings. Regions showing significant volume reduction thresholded at $P=0.01$ in the schizophrenic patients are shown in orange. Bottom panel: (b) functional magnetic resonance imaging (fMRI) findings. Regions are shown where there were significant differences between patients and controls during performance of the n-back task (2-back vs baseline comparison), thresholded at $P=0.01$. Blue indicates hypoactivation, that is, areas where controls activated significantly more than the patients. Orange indicates areas where the schizophrenic patients showed failure to deactivate in comparison to controls. The right side of the images represents the left side of the brain. *Mol Psychiatry.* 2010 Aug;15(8):823-30.
Diffusion tensor imaging (DTI) findings.
Top panel (a) shows areas of significant fractional anisotropy (FA) reduction in the schizophrenic patients identified using TBSS thresholded at P=0.01.
Bottom panels (b) show areas of structural connectivity that differed significantly between the schizophrenic patients and controls, on the basis of the seed placed in the genu of the corpus callosum (upper, shown in red), and the seeds placed in the body of the corpus callosum, right and left (lower, shown in orange). A threshold of P=0.05 corrected was used for this analysis. The right side of the images represents the left side of the brain.

Global analysis of executive function studies in schizophrenia. A, Brain regions with significant activation across executive function task types. In the bottom row, clusters in which controls showed more activation than schizophrenic patients are in red and clusters in which schizophrenic patients showed more activation than controls are in blue. B, Three-dimensional rendering of areas with more activation in controls than in schizophrenic patients across task types (global). L indicates left; R, right.

Forest Plot Showing Effect Sizes for the Group Difference in Bilateral Amygdala Activation for All Included Studies.

Anticevic A et al. Schizophr Bull 2010;schbul.sbq131
State Activation Likelihood Estimation Meta-Analysis Maps for Correlates of Presence vs Absence of Auditory Verbal Hallucination in Schizophrenic Patients Demonstrating Significant Concordance Across Within-Subject Studies (False Discovery Rate Corrected, P < .01, Cluster >100 Voxels).

Kühn S, Gallinat J Schizophr Bull 2010;schbul.sbq152

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Bipolar

• Current models relate to dyscontrol emotional regulation.
  • Decreased volume cingulate gyrus
  • Increased striatal and prefrontal cortex activity when presented affective stimuli when euthymic.
Amygdala-Centric Model of Potential Pathophysiological Changes in BD and MDD

Neuroimaging data suggest that the peri-callosal tissue of the ventro-medial prefrontal cortex known as the anterior cingulate cortex (ACC) (BA 24, 25, and 32) plays a pivotal role in translating OFC-derived valenced data into actions and behavior (Bush)
(A) Loci of the significant group-by-condition interaction \([p \text{ (corrected)} = 0.05]\) for the happy-face paradigm. (B) Activity is shown for bilateral striatum (head of caudate/putamen; left: \([-17, 20, 14]\); right: \([15, 11, 16]\)). (C) Specific between-group contrasts revealed that bipolar individuals (BPI) relative to healthy individuals (HI) showed increased activity in left striatum to mild happy faces (*\(p < 0.05\)). (D) A significant main effect of group is shown for the right dorsolateral prefrontal cortex (DLPFC) \([20, 14, 35]\), with BPI showing significantly decreased activity in response to happy as well as neutral faces (*\(p < 0.05\)). BOLD = blood-oxygenation-level-dependent.

From: Bipolar Disord. 2008 December; 10(8): 916–927.
Left and right subgenual cingulate SDMs, 95% CIs and relative weights for studies included in the meta-analyses. Results are presented for combined groups, unipolar, bipolar, family history positive and family history negative subjects. SDM = standard difference between means; CI = confidence interval; FH- = family history negative; FH+ = family history positive; FH? = family history status not provided; BD = bipolar disorder; UD = unipolar depression. From: J Psychiatry Neurosci. 2008 March; 33(2): 91–99.
MDD subjects exhibited reduced FA in white matter regions underlying dorsolateral prefrontal cortex (DLPFCwm), bilaterally. Translucent green in images on left indicates the a priori AOE for DLPFCwm in the slices shown, which were used to constrain the initial contrast analysis. The color bar indicates the range of p values in this figure, from the threshold (p<0.05) to the order of magnitude of the voxel of peak significance (i.e. smallest p value) in DLPFCwm; color in images is viewed using trilinear interpolation. Cool tones (blues) indicate regions in which MDD subjects exhibited reduced FA relative to control subjects. RH: right hemisphere; LH: left hemisphere.
MDD subjects exhibited elevated FA in the ventral tegmental area/substantia nigra (VTA/SN), which localized to the ventral/lateral edge of the substantia nigra (SN) adjacent to the cerebral peduncle, and the nigral fiber system (striatonigral, nigrostriatal, and corticostrial fibers). Translucent green in image on left indicates the a priori AOE for the VTA/SN in the slice shown, which was used to constrain the initial contrast analysis. The color bar indicates the range of p values in this figure, from the threshold (p<0.05) to the order of magnitude of the voxel of peak significance (i.e. smallest p value) in the VTA/SN; color in images is viewed using trilinear interpolation. Warm tones (red, orange, yellow) indicate regions in which MDD subjects exhibited elevated FA relative to control subjects. RH: right hemisphere; LH: left hemisphere.

Areas with significant gray matter volume reduction in depressive patients compared with normal subjects. (a) Maximum intensity projections (“glass brain”) of voxel t values computed using SPM5 to show areas in which gray matter volume in depressive patients is smaller than that in controls. Images are thresholded to show clusters of > 15 voxels for which P (uncorrected) < 0.001. Red arrowhead indicates the global maxima. A, P, L, and R indicate anterior, posterior, left, and right of the subjects, respectively. (b) Right parahippocampal region showing regional gray matter volume decrease in depressive subjects are rendered onto the coronal T1 template image. The color bar (bottom right) represents the T score. (c) Right anterior cingulate region showing regional gray matter volume decrease in depressive subjects are rendered onto the sagittal T1 template image. The number at the top left of each image indicates the value of the MNI coordinate.
Group × valence × phase interaction. There was differential sensitivity of the right amygdala/hippocampus to emotional intensity in PTSD vs. controls according to valence and retrieval phase. The PTSD group showed greater recruitment of this region during the construction of emotionally intense negative autobiographical memories, whereas the control group showed greater recruitment here during construction of emotionally intense positive memories.

http://dx.doi.org/10.1016/j.jpsychires.2010.10.011
Group × valence interaction. There was differential sensitivity in the ventral medial prefrontal cortex (PFC) in PTSD vs. controls to valence across both construction and elaboration phases of autobiographical memory retrieval. The PTSD group showed greater recruitment of the ventral medial PFC for negatively intense autobiographical memories, whereas the control group showed greater recruitment of this region for positively intense memories. http://dx.doi.org/10.1016/j.jpsychires.2010.10.011
Wernicke Encephalopathy

- a neurologic emergency caused by a thiamine deficiency
- common in the alcoholic population but can also be seen with malignancy,
- total parenteral nutrition,
- abdominal surgery,
- hyperemesis gravidarum,
- hemodialysis,
- or any situation that predisposes an individual to a chronically malnourished state

The classic triad of WE includes ataxia, global confusion, and ophthalmoplegia. However, this triad is often not present in many adult and pediatric patients. The most common presenting symptom is nonspecific mental status changes. A high degree of suspicion for WE is warranted in patients with systemic illnesses, malnutrition, and alcoholism.
Wernicke's

--61-year-old alcoholic man with Wernicke encephalopathy during acute phase of disease

Marchiafava-Bignami Disease

MBD is a rare disorder that results in progressive demyelination and necrosis of the corpus callosum.

- is generally associated with chronic alcohol abuse but is occasionally seen in nonalcoholic patients
- is most prevalent in men between 40 and 60 years of age. However, the disease has also been reported in the pediatric population
- main pathologic change associated with MBD is degeneration of the corpus callosum, which may vary from demyelination to frank necrosis. Necrosis produces cystic cavities within the corpus callosum, mainly in the genu and splenium

The disease may present in two major clinical forms: acute and chronic.

- **Acute form**, which often results in death, patients present with severe impairment of consciousness, seizures, and muscle rigidity
- **Chronic form** of the disease may last for several months or years and is characterized by variable degrees of mental confusion, dementia, and impairment of gait
--53-year-old alcoholic woman with Marchiafava-Bignami disease during subacute phase
--53-year-old alcoholic man affected by Marchiafava-Bignami disease
Osmotic demyelination syndrome (ODMS) is an acquired condition that results in an osmotic insult and demyelination of the basis pontis. Although the pontine base represents the most common site of involvement, lesions do occur outside of the pons.

The extrapontine lesions are typically seen in the thalami, basal ganglia, lateral geniculate body, cerebellum, and the cerebral cortex.

ODMS is most commonly seen in the setting of hyponatremia and its acute correction, or in patients with a history of chronic alcohol abuse and malnutrition.
--67-year-old alcoholic man after rapidly corrected hyponatremia

Encephalitis, unidentified causative agent. (A) Axial fast spin-echo (FSE) T2-weighted (T2w) image shows bilateral basal ganglia, thalamic and cortical hyperintense abnormalities without significant mass effect (arrowheads). Diagnosis of viral encephalitis was based on clinical course, CSF analysis, and MRI appearance. Imaging findings may be indistinguishable from metabolic and toxic etiologies. (B) Corresponding axial fluid-attenuated inversion recovery (FLAIR) image demonstrates increased conspicuity of the lesions.

http://dx.doi.org/10.1053/j.ro.2006.08.012.
Summary

• In neurology, trauma and infectious disease, CT and MRI testing is highly useful.
• There is considerable work around risk factors and risk areas in psychiatry.
• The weakness in this area is the lack of precision is defining symptoms and setting criteria for caseness.
• No neuroimaging technique that has been shown to be diagnostic in non-organic psychiatry.