

What is claimed is:

1. A method for determining dopamine function in a subject, the method comprising analyzing one or more Neuromelanin (NM)-Magnetic Resonance Imaging (NM-MRI) scans of the subject's dopamine-associated brain region of interest, wherein the analyzing comprises:
 - receiving imaging information of the brain region of interest;
 - determining a NM concentration in the brain region of interest using voxelwise analysis based on the imaging information; and
 - determining the dopamine function based on the NM concentration;wherein the determining of the dopamine function comprises: (1) if the one or more NM-MRI scans has increased NM signal compared to a one or more control scans then dopamine function is increased; or (2) if the one or more NM-MRI scans has decreased NM signal compared to a one or more control scans then dopamine function is decreased.
2. The method of claim 1, wherein the voxelwise analysis comprises determining at least one topographical pattern within the brain region of interest.
3. The method of claim 2, wherein the at least one topographical pattern includes at least one pattern comprising a change in cell number in the brain region of interest.
4. The method of claim 1, wherein the one or more acquired NM-MRI scans are related to the subject's performance on a cognitive task.
5. The method of claim 4, wherein the cognitive task assesses catecholamine-related processes.
6. The method of claim 5, wherein the catecholamine-related processes comprise dopamine-related processes.
7. The method of claim 5, wherein the catecholamine-related processes comprise reward processing.
8. The method of claim 1, wherein the brain region is at least one of the substantia nigra, ventral substantia nigra, lateral substantia nigra, ventrolateral substantia nigra, substantia nigra pars compacta (SNpc), substantia nigra pars reticulata (SNpr), and ventral tegmental area (VTA).
9. The method of claim 1, wherein the subject has or is suspected of having one or more dopamine function-related disorder.
10. The method of claim 1, wherein the subject has or is suspected of having schizophrenia spectrum disorders.

11. The method of claim 1, wherein the subject has or is suspected of having psychotic illness.
12. The method of claim 1, wherein the subject has or is suspected of having addiction disorder.
13. The method of claim 1, wherein the subject has or is suspected of having at least one of depression or late-life depression.
14. The method of claim 1, wherein the subject has or is suspected of having bipolar disorder.
15. The method of claim 1, wherein the subject has or is suspected of having Huntington's disease.
16. The method of claim 1, wherein the subject has or is suspected of having Parkinson's disease.
17. The method of claim 1, wherein the subject has or is suspected of having one or more movement disorders.
18. The method of claim 1, wherein the subject has or is suspected of having psychomotor slowing.
19. The method of claim 1, wherein the subject has or is suspected of having one or more neuropsychiatric disorders.
20. The method of claim 1, wherein the subject has or is suspected of having a cocaine use disorder.