



## Developing a Precision Mental Health Center for Rapidly Translating Neuroscience into Personalized Care

*“We are connecting our novel brain-based tests with first responders at the front lines of care, to get the right treatment to the right person at the right time”; Dr. Leanne Williams, Professor of Psychiatry and Behavioral Sciences*

There is a fierce urgency to revolutionize how we diagnose and treat depression. We are focusing first on depression as an area of staggering disability and disparity, serving as a prototype for expansion to other areas of need. Major depression affects at least 1 in 10 people across the lifespan and accounts for 1 in 5 primary care visits. It is now our number 1 cause of lost hope and disability, here in the US and also across the world.

We need to get the choice of treatment right the first time. Right now, only one third of people get the right treatment quickly enough to recover. Finding the right treatment usually occurs by chance. It often takes many years of trialing one treatment option after another, based on the clinician’s wisdom and on “waiting and seeing” after each trial. This process leads to chronic loss of hope, disability and an increased risk of suicide.

Our current diagnostic criteria for depression are based on a broad checklist of possible symptoms. While it may be a reliable way for scientists and practitioners to communicate, it tells us little about what combinations of symptoms are most important for each person’s treatment and how they relate to the organ of interest, the brain. We could not imagine guiding cancer treatment decisions over time if we did not know about the type of cancer and its biological characteristics.

In this Center we develop and test a radically new treatment strategy for depression based on precise imaging of the brain. We have defined eight “biotypes” that are grounded in existing knowledge about the distinct ways that brain networks may be disrupted and generate specific symptoms of depression (Fig. 1). For the first time we use this brain network taxonomy to guide the choice of treatment most suited to each person’s biotype and accompanying symptoms. We need to get treatment right the first time and this is the goal of the Center.

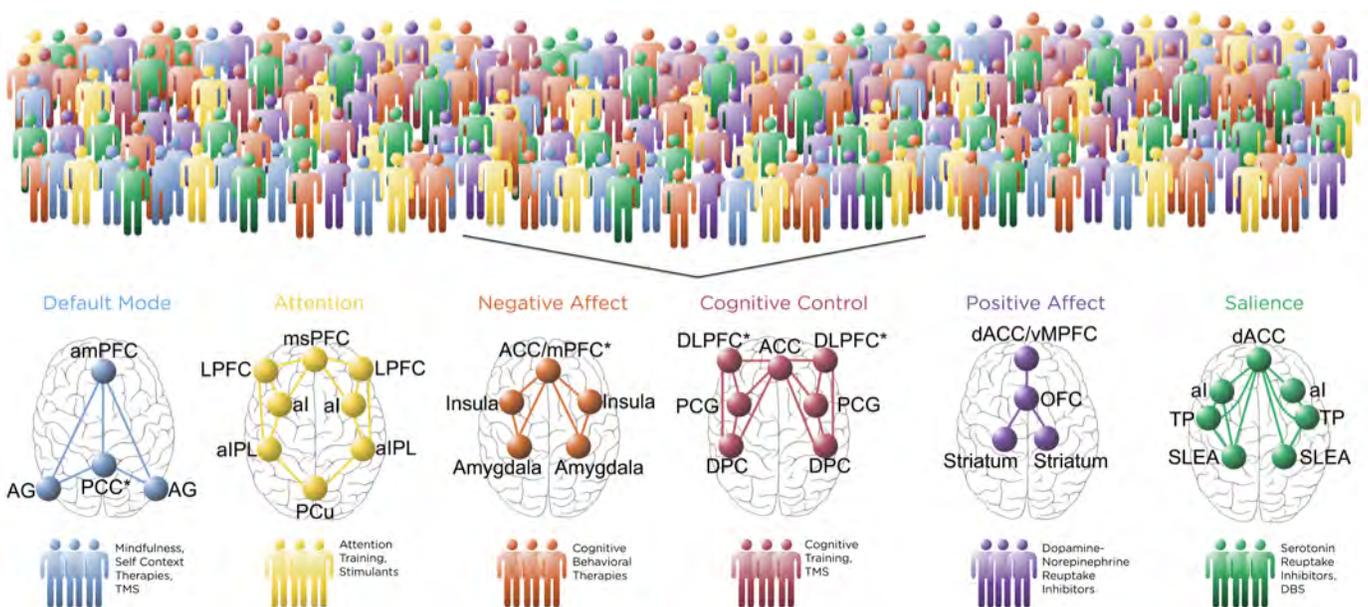


Fig. 1. Dr. Williams’s biotype taxonomy explains depression in terms of brain network dysfunctions. This taxonomy is the foundation for early successes in predictive biotype markers that guide personalized treatment.

In early successes, Dr. Williams has found that biomarkers based on specific biotypes predict with accuracy who will respond to which depression treatment and why. Biomarker tests are undertaken using brain imaging and associated genetic information. These tests have a validated accuracy of over 75%.

*Using her predictive personalized biomarker tests, Dr. Williams and her team are on track to double the number of people who recover from depression. This means 122 million more people here and across the world could get their lives back.*

Capitalizing on these early successes and the mechanisms of treatment action, the Center will undertake the world's first prospective, real-world trials to guide treatment choice according to the biotype of each patient. Using baseline brain scans we will classify never-before treated people with depression into three biotypes or into a comparison group. Interventions will include commonly used antidepressants, novel antidepressants, novel FDA approved new treatments for such as neurostimulation and online adjunctive interventions. We will assess the extent and rate to which patients get better as a function of their pre-treatment biotype. Outcomes include symptom alleviation, side effect profile, adherence and daily function. Outcomes will feed back into continual refinement of the predictive models. Prospective trials will be undertaken hand in hand with basic neuroscience discovery work to continually refine the biotypes with precision imaging, genetic, behavioral and sociodemographic information. To further accelerate progress along these parallel pathways we will harness the power of advanced computational modeling and data science approaches.

*Stanford is ideally poised to seize the lead in Precision Mental Health. Our Center reflects an alignment of minds and expertise that occurs rarely.*

Our integrative approach is seeded in Stanford's uniquely interdisciplinary environment. Our team combines field-leading expertise in clinical neuroscience, experimental therapeutics and the clinical translation of imaging research into clinical practice. We leverage Stanford's intellectual and technological expertise across the disciplines of mental health, neuroscience, neuroimaging, big data science, experimental therapeutics and public health. We work in a close and respectful partnership of researchers and practitioners, and the volunteers who participate with us in this new cutting edge research. With this precision approach to treating depression we have the opportunity to improve and save the lives of many.

The Precision Mental Health Center takes a risky but necessary leap forward in bridging the yawning gap between brain insights and clinical practice. The risk from not making this leap is much greater. Practitioners do not have brain-based tools to inform their decisions. By testing a brain network taxonomy proposed to match with clinical symptoms we address this gap head on. Our results will revolutionize the way psychiatry and mental health care is practiced. They will serve as a prototype for expanding rapidly to additional interventions and to other areas of disparity and need. Our integrative collaborative model will stimulate the ongoing integration of basic and clinical science, and the seamless translation between discovery and real world practice.

*The future of psychiatric medicine will rely on predictive neuroscience markers that personalize treatment choices and guide preventative approaches.*