*Project Summary* Cognitive control appears to be one of the most consistently and severely affected functions in opioid use disorder (OUD), putting opioid users at higher risk of treatment dropout and drug relapse. While treatment programs for OUD typically focus on the cessation of substance use, there is now a firm basis for treatment programs to consider cognitive control difficulties in order to provide more neurocognitive targeted support for people seeking treatment for OUD. Our long-term goal is to increase opioid users' success in treatment and maintaining abstinence by improving their cognitive control functioning. The main scientific premise is that cognitive control functioning may be improved in OUD by modulating reward activity of the midcingulate cortex with a non-invasive brain stimulation method called robot-assisted transcranial magnetic stimulation (TMS). In particular, we aim to enhance midcingulate reward activity in OUD, as evaluated by an EEG-based biomarker called the reward positivity, with TMS by targeting the frontal-cingulate circuitry. Providing current treatment programs with a highly effective brain-based intervention may increase opioid users' success in treatment, and thereby help reduce the major burden substance use disorders places on the US healthcare system. This NIH grant is a collaborative partnership between three Rutgers researchers, Drs. Kathryn Biernacki, Catherine Myers, and Suchismita Ray.