## Lay Abstract

Cervical dystonia (CD) is one of the most common forms of dystonia. For most CD patients, the disorder results in life-long disability and, in many cases, substantial pain and depression. Current treatments such as botulinum toxin injections provide some symptom relief. Yet the results are imperfect and there are unwanted side effects. Furthermore, the treatments have to be repeated indefinitely and represent a substantial cost to patients and/or their insurance providers. Research efforts to optimize current treatments and develop new treatments are underway but take many years. **One of the critical problems central to all of these issues is the lack of a method to measure symptoms in CD <u>objectively</u>**. There continue to be advances in the most prominent tool for measuring symptoms in CD: the Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS). However, it is based on human judgment from a doctor's observation of the patient. Therefore it is susceptible to biases depending on the doctor, and different doctors administer and score the TWSTRS differently. Furthermore, complex aspects of CD, including movements such as tremors, are difficult to measure from human observation. Thus, in this project, **we will develop a novel, computerized method to make these measurements in a truly objective fashion**. The method is based on advanced software called the Computer Expression Recognition Toolbox (CERT). CERT uses patient videos, typically recorded with a standard video camera at 30 frames per second. CERT automatically measures the position of the head on each frame, as well as facial expressions associated with pain, so that complex movements and pain that vary from one patient to the next can be precisely detected and quantified without requiring human judgment. Thus CERT will provide a powerful objective complement to the existing subjective clinical evaluation, helping doctors to **assess CD accurately, treat it optimally, and help develop new treatments** by accelerating research into the brain abnormalities associated with different characteristic features of CD.