Research Development Fund – FALL FY17 Cover Page

Application Title: Development of Laboratory for Robotic Rehabilitation at Texas A&M University

Lead contact for RDF Application:

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Key Participating Units: Engineering (Mechanical, Biomedical), Education (Health and Kinesiology). Discussions are pending with at least two other colleges which may participate in the final proposal.

Anticipated Request Amount ($): $903,000

Executive summary of the intended application to utilize Research Development Funds:

Biomedical robotics is expected to reach $12B by 2020. Robotic rehabilitation, which focuses on the design, development and clinical evaluation of robotic exoskeletons for upper and lower limb rehabilitation facilitate the physical rehabilitation process for those who have suffered stroke or are suffering from neuromuscular diseases affecting limb motion. A number of research institutes around the world (including Swiss Federal Institute of Technology and those in the US at MIT, Northwestern, Maryland, UT at Austin and Rice) are actively working on the development of robotic systems that emulate and support human therapists. Texas A&M University has also been engaged in the development of both upper limb robotic exoskeletons (Drs. Langari, Buchanan) and lower limb exoskeletons and prostheses (Dr. Hur) in collaboration with colleagues in California and Doha, Qatar with prototype devices that are under development.

The proposed RDF funding will enable this core research group to build on these studies by developing a focused laboratory that is equipped with state of the art instrumentation for measurement of human motion performance and in-situ evaluation of prototype robotic exoskeletons. While the individual laboratories of the lead investigators are presently equipped with some of these functionalities, the RDF funding will enable a more focused and interdisciplinary collaboration in a truly state of the art laboratory that would provide a viable basis for seeking external funding from NIH (through the National Robotics Initiative jointly funded by NSF as well DARPA among other sources.

The proposed instrumentation include:

- CAREN System from Motek: Computer Assisted Rehabilitation Environment (CAREN) system includes a motion capture system, a multi-sensory virtual reality system, and a 6DOF motorized platform that includes instrumented (with force platform) treadmill, estimated at $650,000.
- A portable fNIRS system (TECHen): Rehabilitation studies in many cases need to show neuroplasticity via imaging throughout the rehabilitation progression, estimated at $62,000.
- A portable VO2Max device (COSMed): A portable VO2Max device can measure oxygen consumption of human while performing given tasks, estimated at $55,000.
- An OPTOTRAK Certus camera (Northern Digital). This is a camera system that records human motion in 3D, estimated at $65,000.
- A TMS device to allow for the production of MEPs through the stimulation of the motor cortex. In order to stimulate other brain regions and produce MEPs special brain mapping software (Brainsite for TMS, by Rogue Resolution) is required. The ability to stimulate other brain regions allows for experiments to help determine cortical pathways and neural area interactions, estimated at $71,000.

These instruments will be housed at a location that will allow for common usage by researchers from across the areas noted in the heading of this cover sheet and will enable true interdisciplinary effort in an area where funding opportunities are extensive but require effective infrastructure for TAMU to be truly competitive.