

Research Development Fund – 2020-2021 Application

Application Title: Development of Laboratory for Technology-assisted Human Augmentation and Rehabilitation (TaHAR) at Texas A&M

Lead contact for RDF Application:

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Key Participating Units:

- **College of Engineering:** Electrical (H. Park), ETID (J. Kim), ETID/Mechanical (K. Lee)
- **College of Education and Human Development:** Health and Kinesiology (A. Nordin)
- **Centers:** Human Clinical Research Facility (HCRF)

Anticipated Request Amount (\$): \$800,000

Executive summary of this application to utilize Research Development Funds:

Improving quality of life for people with disabilities has been a focus across a broad range of disciplines. Several interdisciplinary and collaborative approaches at TAMU have worked to address this topic; (1) assessment and evaluation and (2) recovery and enhancement of physical human capability is one of the primary focus areas in this respect. Despite the ongoing research activities and rapidly growing interests, there are limited centralized, shared equipment and resources available to promote this topic of research at Texas A&M University currently. The proposed research facility will not only enable research in these areas to collect preliminary research data to target larger, external research funds (e.g., NIH Centers, NSR MRI, etc.), but also promote the collaborative research in various research fields to solve the scientific problems that are related to the physical and cognitive human health.

The goal is to build a ***shared*** research facility, laboratory for **T**echnology-assisted **H**uman **A**ugmentation and **R**ehabilitation (TaHAR), by a team of investigators from several colleges at TAMU in the areas of biomechanics, biomedical electronics, neuroscience, and rehabilitation research to promote the foundational and collaborative research in these fields as a centralized research facility that can easily accessible for any TAMU researchers and collaborating partners. The proposed facility will be utilized for current and future research that includes, but not limited, to *quantitative analysis of human behavior with interventions* involving physical human augmentation (i.e., robotic exoskeletons) and electrical stimulations (i.e., peripheral sensory stimulation, brain stimulation, functional electrical stimulation). These techniques are essential to addressing severe disabilities such as stroke, spinal cord injuries and neurological disorder. For this purpose, TaHAR will be strategically housed in the ***Human Clinical Research Facility (HCRF)***, which will effectively facilitate new and ongoing research activities and stimulate collaborations.

The main equipment for the TaHAR Lab proposed in this proposal are (1) Lokomat® by Hocoma, a robot-assisted therapeutic mechanism that enables effective and intensive training to increase the strength of muscles and the range of motion of joints in order to improve walking gait; (2) Armeo® Power by Hocoma, a robotic exoskeleton for upper extremity rehabilitation with six actuated degrees of freedom, which allows training in an extensive 3D workspace; and (3) VICON, high quality real-time optical motion capture and analysis system with 10 optical cameras.

The proposed facility will support a broad range of rehabilitation research while complementing to existing equipment and new technologies developed by TAMU researchers. In particular, the state-of-the-art rehabilitation and assessment equipment proposed in this project will make TAMU research teams to be more competitive in securing research funding. This RDF project will lead to large-scale research proposals (e.g., NIH R01s) and NIH and NSF center proposals within the project period. The PIs will not only establish the TaHAR lab, but also lead these subsequent proposals as well as supporting proposals and ongoing project activities by other TAMU researchers.