Title: Twisted and coiled actuator for providing shoulder stability during overhead tasks to reduce the risk of musculoskeletal disorders (MSDs)

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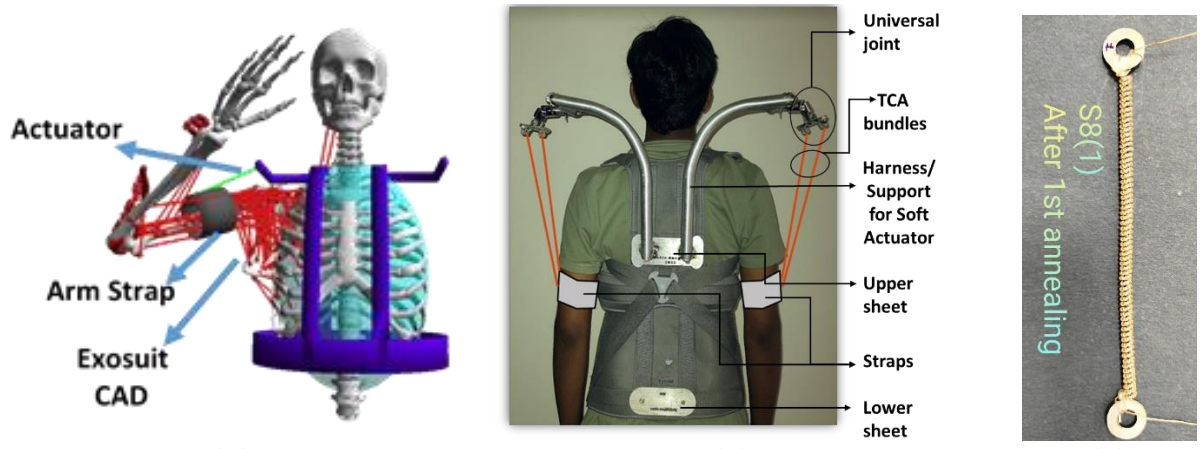
Musculoskeletal disorders (MSDs) and injuries are a common factor affecting the industrial workforce and are responsible for reducing productivity as well as the quality of life of skilled personnel. Overhead work-related MSDs are quite common and hence the focus of this project is to provide shoulder stability and reduce such occurrences in the workplace. The **two-fold objective** of this joint project activity **(IHFC-NSF)** encompasses a **Musculo-Skeletal Simulation** as well as the fabrication of a **shoulder stability exosuit using** the **Twisted and Coiled Actuator (TCA) mechanism.** The simulation of the musculoskeletal model can aid in the prediction of the forces and torques about the shoulder and elbow joints for the desired motion. Additionally, the reduction in the muscle activities and joint torques have been calculated while receiving assistance from the external device. Based on the information from the simulation, the physical fabrication of the actuator can be targeted to achieve the desired reduction in muscle activity and delay fatigue onset in the human. The fabrication of a **wearable exosuit structure** has also been carried out in parallel and the device form factor is prepared for housing the actuator. Further, the **in-house fabrication of the TCA** mechanism has been achieved and tested with different material combinations. Thereafter, prototyping of the TCA-based actuator is ongoing, to obtain the desired assistance at the shoulder joint.



(A) (B) (C)

Figure 1 – (A) The musculoskeletal model used for the simulation of the overhead working, (B) the in-house fabricated exosuit and components, and (C) a single fabricated TCA actuator fiber.