

# Biomechanical modeling of an assistive shoulder orthoses

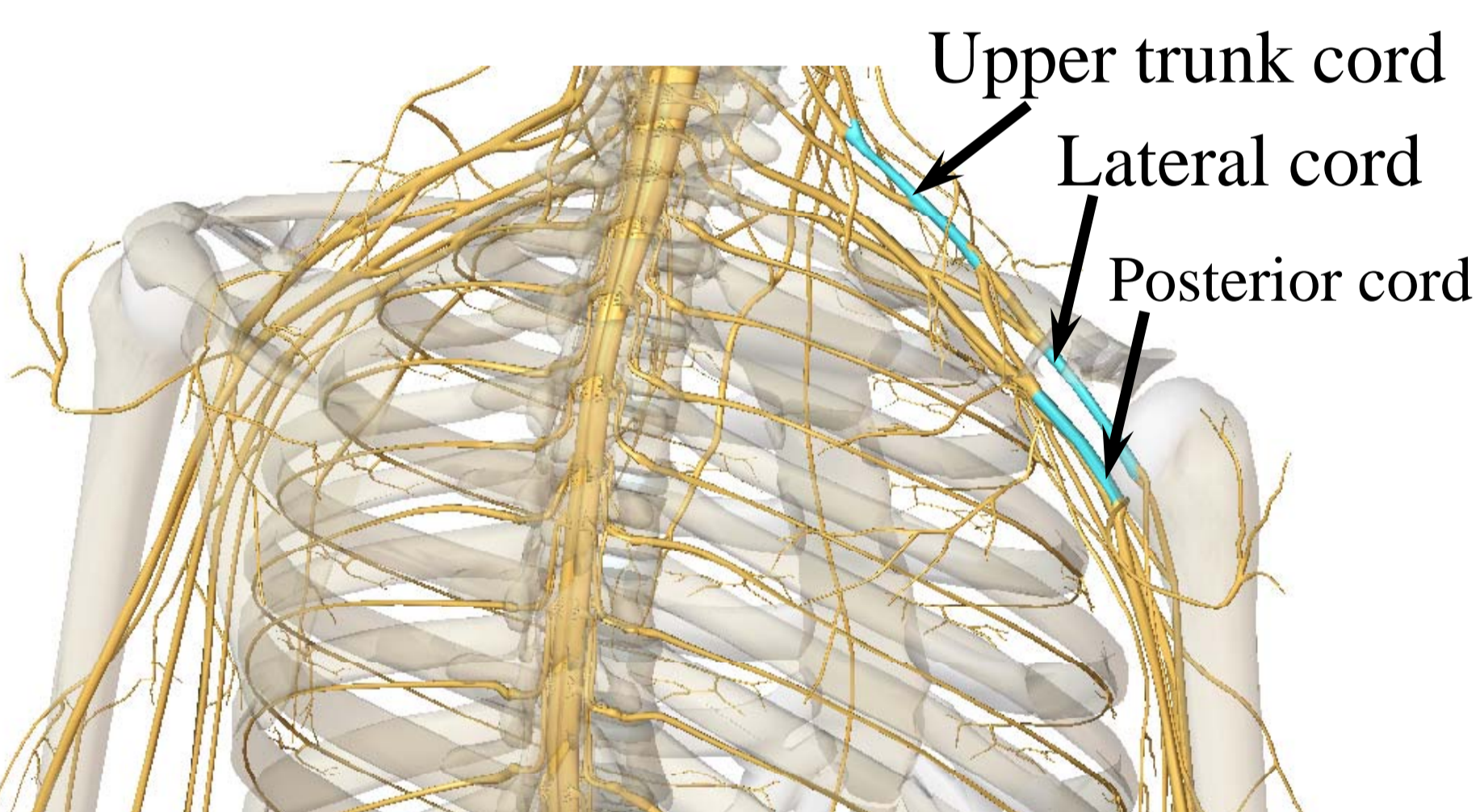
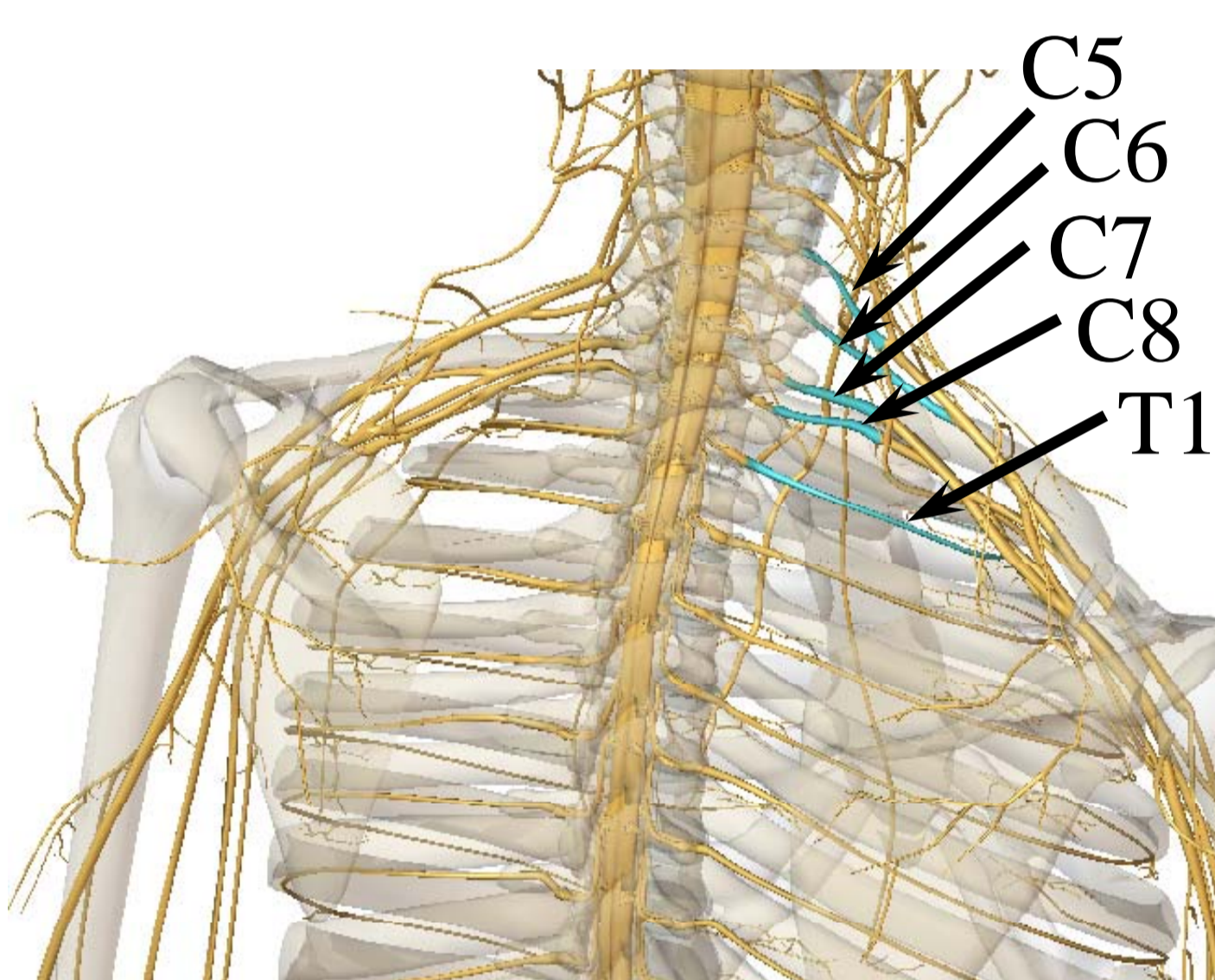
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## Introduction

An approach of designing assisting devices on the basis of simulation of the exoskeleton and a human body model is proposed in this paper. The new approach, addressing the problem of physical human-machine interactions, models and simulates the mechanics for both the assisting device and the human body, which allows designers to analyze and evaluate a design for its functioning effectively. A simulation platform is developed by integrating a biomechanical model of human body and the mechanical assisting device. With the proposed approach, an orthoses is designed for assisting patients with neuromuscular injuries.

## Design case

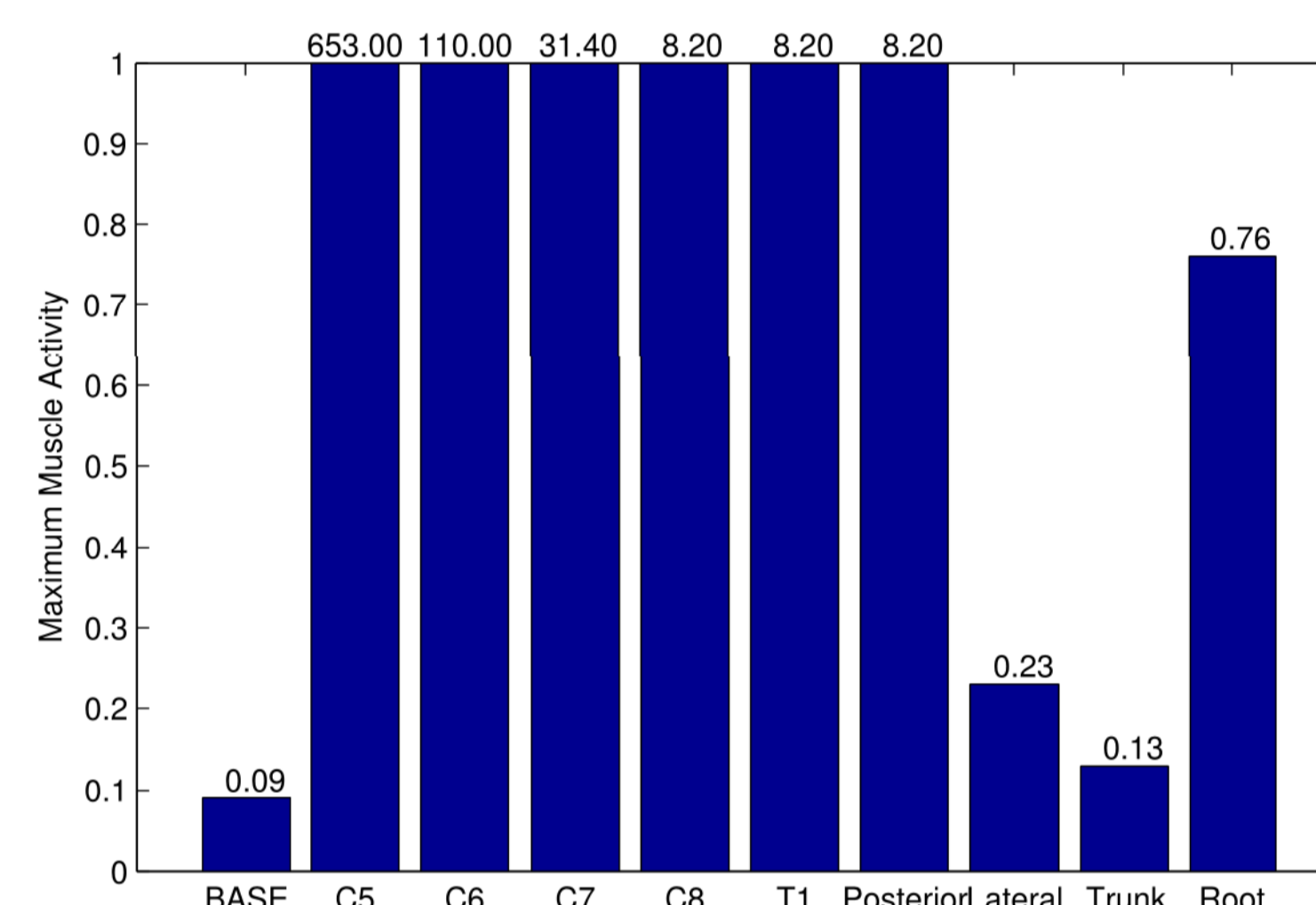
Brachial plexus is a network of nerves, which originates in the fifth, sixth, seventh and eighth cervical (C5-C8), and first thoracic (T1) spinal nerves. Brachial plexus injury arising typically from falls and traffic accidents.



## Biomechanical modeling

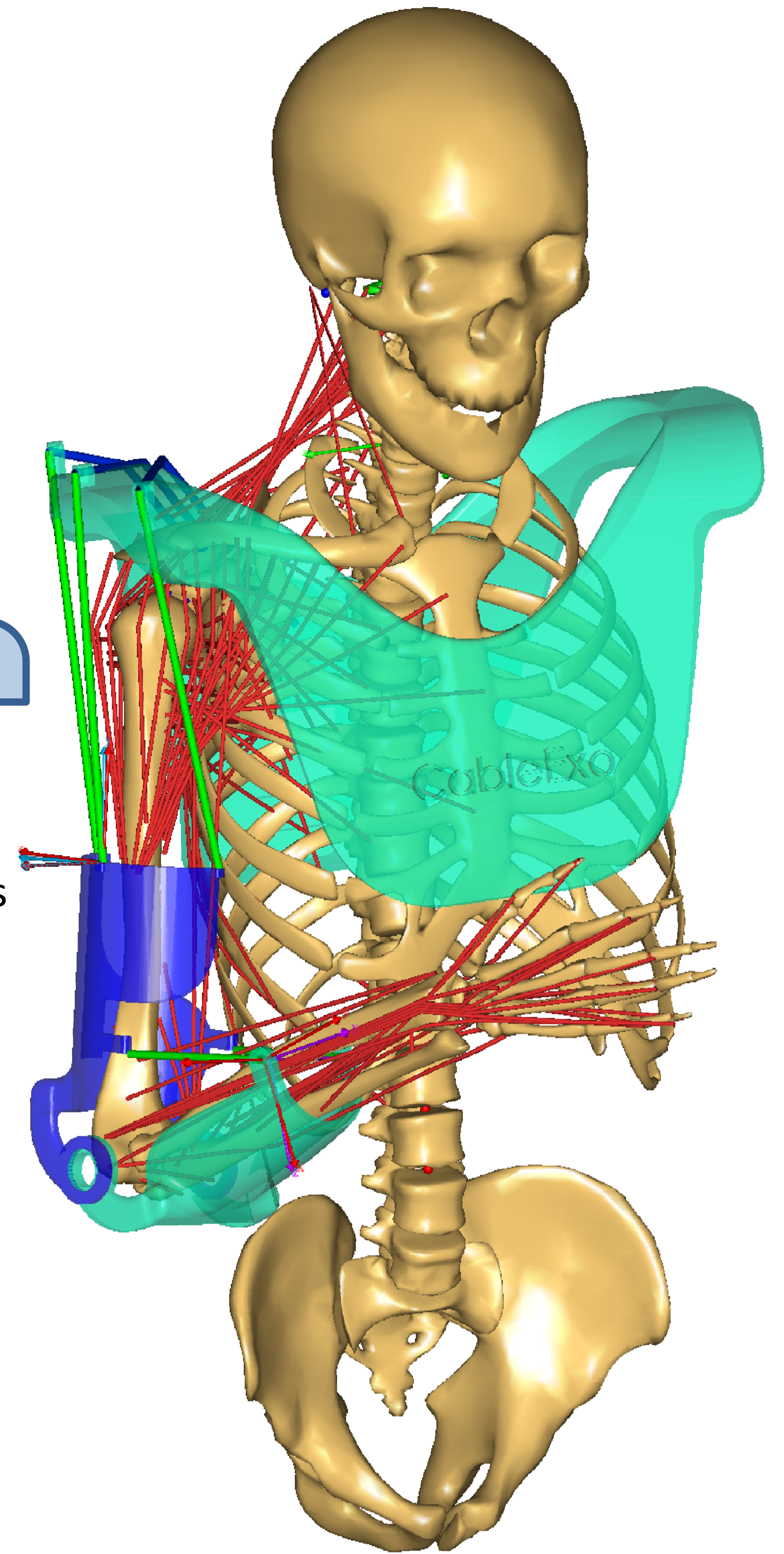
- AnyBody Modeling System
- 39 joints and 134 muscles modeled
- Able to simulate the healthy subjects and patients with brachial plexus injury

### Maximal muscle activities for different nerve lesions

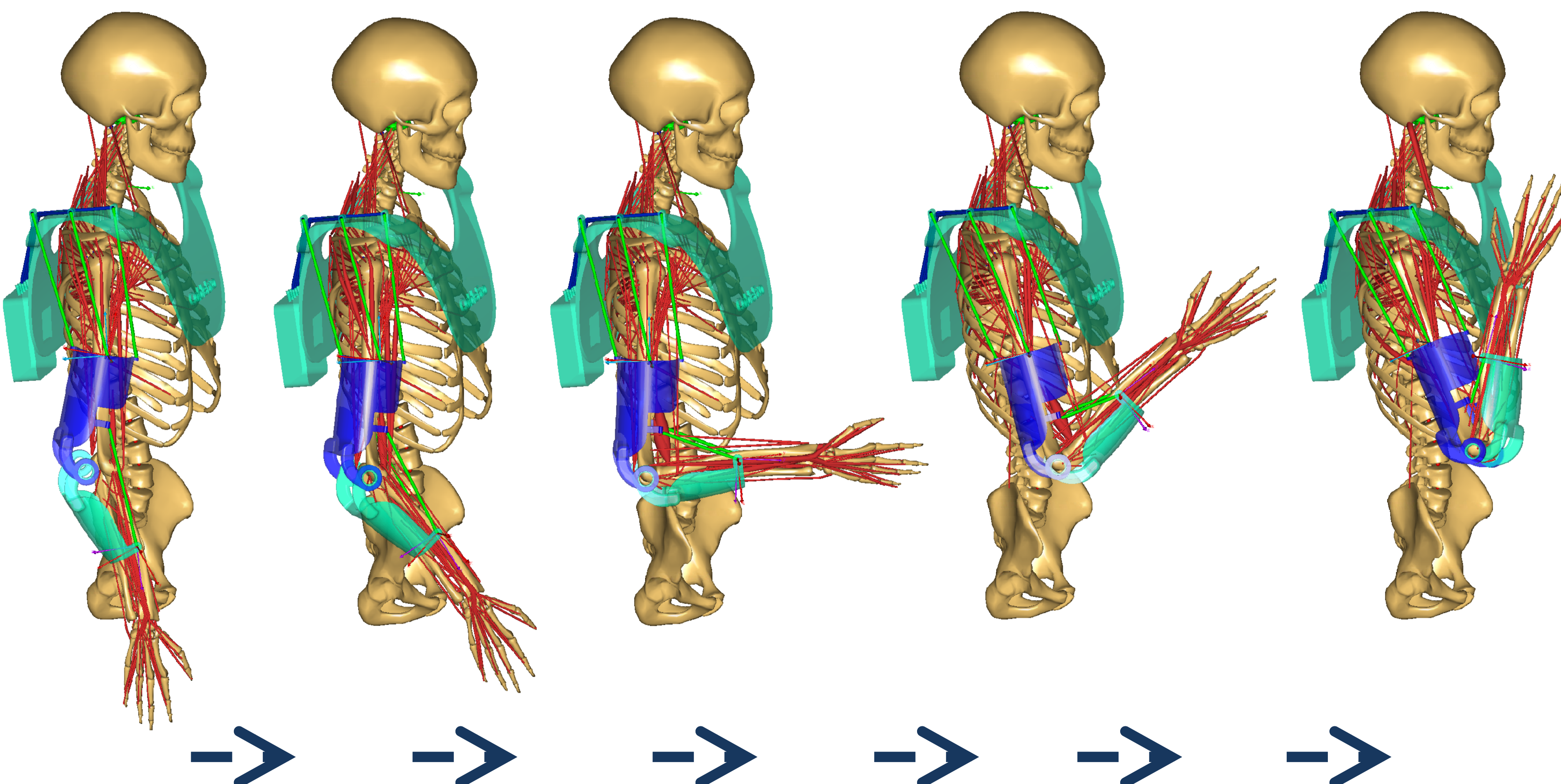


## Innovative orthoses design

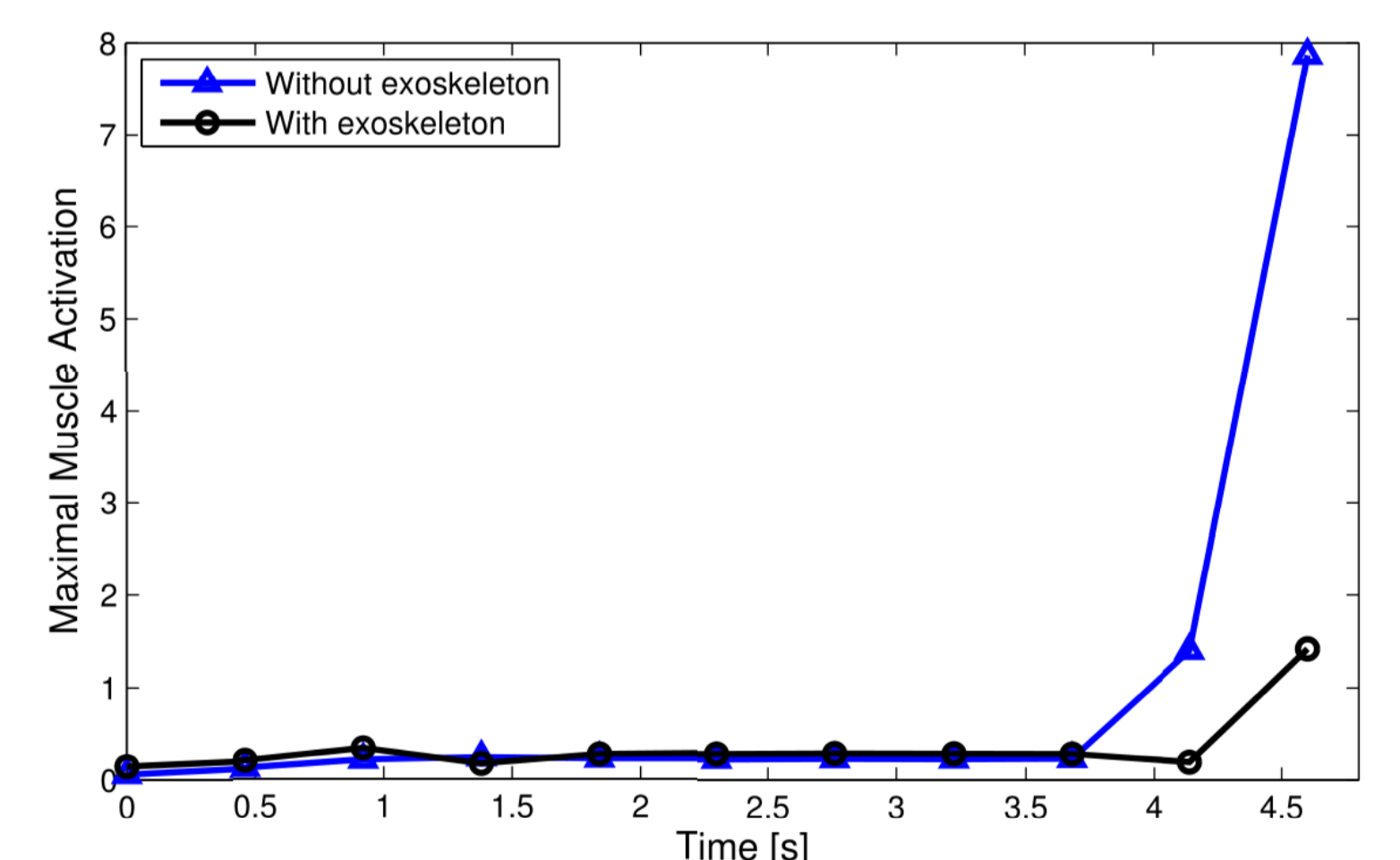
- Wearable
- Spring-loaded cable-driven
- Adjustable pre-load forces
- Parametric design of the springs based on biomechanics simulation



## Motion of picking up a phone, duration 4.6 seconds



### Influence of the orthoses to the human body



### Interaction force between the orthoses and the human body

