Short communication

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Alexander J. Barry, Wendy M. Murray, Derek G. Kamper

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Development of a Dynamic Index Finger and Thumb Model to Study Impairment

Alexander J Barry[a,*,abarry@sralab.org], Wendy M Murray[a,b,c,d,e], Derek G Kamper[c,f,g]

[a]Shirley Ryan AbilityLab, Chicago, IL

[b]Department of Biomedical Engineering, Northwestern University, Evanston, IL

[c]Department of Physical Medicine & Rehabilitation, Northwestern University Feinberg School of Medicine, Chicago, IL

[d]Department of Physical Therapy and Human Movement Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL

[e]Edward Hines, Jr. VA Hospital, Hines, IL

[f]UNC/NC State Joint Department of Biomedical Engineering, North Carolina State University, Raleigh, NC, University of North Carolina at Chapel Hill, Chapel Hill, NC

[g]Closed-Loop Engineering for Advanced Rehabilitation Research Core, North Carolina State University/ University of North Carolina at Chapel Hill, Raleigh/ Chapel Hill, NC

[*]Corresponding author at: 355 E Erie St., 22nd Floor Shirley Ryan AbilityLab Chicago, IL, 60611

Abstract

Modeling of the human hand provides insight for explaining deficits and planning treatment following injury. Creation of a dynamic model, however, is complicated by the actions of multi-articular tendons and their complex interactions with other soft tissues in the hand. This study explores the creation of a musculoskeletal model, including the thumb and index finger, to explore the effects of muscle activation deficits. The OpenSim model utilizes physiological axes of rotation at all joints, passive joint torques, and appropriate moment arms. The model was validated through comparison with kinematic and kinetic experimental data. Simulated fingertip forces resulting from modeled musculotendon loading largely fell within one standard deviation of experimental ranges for most index finger and thumb muscles, although agreement in the sagittal plane was generally better than for the coronal plane. Input of experimentally obtained