

Summer Student Research Program

Project Description

FACULTY SPONSOR'S NAME AND DEGREE: *Kang Li, PHD*

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PROJECT TITLE (200 Characters max):

Therapeutic and diagnostic modalities for children with neuromuscular upper extremity dysfunction

HYPOTHESIS:

Children with conditions such as cerebral palsy or brachial plexus birth palsy will benefit from novel treatments as well as development of diagnostic tools

PROJECT DESCRIPTION (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)

Design: The needs of children with severe upper extremity dysfunction secondary to cerebral palsy (CP), those at the lower end of the Manual Ability Classification System (MACS), are not being met by current treatment options. While children who function at level I or II are able to handle objects, those with levels III-V can either do so with difficulty or not at all. In a rare study looking at upper extremity interventions separated by MACS levels, the most common interventions for children functioning at levels IV or V were performed for the purposes of improving hygiene, pain, or ease of care, rather than for function. The total percentage of children with MACS IV or V has been reported to be between 23-38%, based on either a population or hospital based cohort, yet to date they have comprised 9% of all study participants. In children with CP, upper extremity function is highly correlated with the development of self-care and independence.

Methodology: Videotapes of children performing functional upper extremity tasks will be analyzed using AI technique to look for patterns of positioning and proximal vs. distal joint motion.

Data Collection: Standard physical examination outcome measures will be performed, including passive and active range of motion of the shoulder, elbow, forearm, wrist, fingers, and thumb, and the modified Ashworth scale. Further evaluation will include the following measures: Assisting Hand Assessment (AHA), Melbourne Assessment 2 (MA2), and the Pediatric Motor Activity Log-Revised (PMAL-R).

Data Analysis and Interpretation: Accepted outcome measures will be compared to AI techniques of analysis

SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:

Chiu DTW, Patel A, Sakamoto S, **Chu A**. The impact of microsurgery on congenital hand anomalies associated with amniotic band syndrome. *Plastic and Reconstructive Surgery Global Open*.

Chu A. Non-motor difficulties in children with idiopathic clubfoot: can this impact brace adherence? *Dev Med Child Neurol* 2018 Oct 10.

Rahil Meherizi, Xi Peng, Shaoting Zhang, Xu Xu, **Kang Li** (2019) A Deep Neural Network-based Method for Estimation of 3D Lifting Motions. *Journal of Biomechanics*. 84, 87-93.

Rahil Meherizi, Xi Peng, Xu Xu, Shaoting Zhang, Dimitris Metaxas, **Kang Li** (2019) Estimating 3D L5/S1 Joint Load during Lifting Using a Deep Learning Based Method. *IEEE Transactions on Human-Machine Systems*. 49(1), 85-94.

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Zhongyu Li, Erik Butler, **Kang Li**, Aidong Lu, Shuiwang Ji, Shaoting Zhang (2018) Large-scale Exploration of Neuronal Morphologies using Deep Learning and Augmented Reality, Neuroinformatics. 16(3-4), 339-349.

Rahil Meherizi, Xi Peng, Xu Xu, Shaoting Zhang, Dimitris Metaxas, **Kang Li** (2018) A Computer Vision Based Method for 3D Posture Estimation of Symmetrical Lifting. Journal of Biomechanics. 69, 40-46.

Rahil Meherizi, Xu Xu, Shaoting Zhang, Vladimir Pavlovic, Dimitris Metaxas, **Kang Li** (2017) Using a marker-less method for estimating L5/S1 moments during symmetrical lifting. Applied Ergonomics. 65, 541-550.

THIS PROJECT IS: **Clinical** **Laboratory** **Behavioral** **Other**

THIS PROJECT IS CANCER-RELATED

Please explain Cancer relevance

THIS PROJECT IS HEART, LUNG & BLOOD- RELATED

Please explain Heart, Lung, Blood relevance

THIS PROJECT INVOLVE RADIOISOTOPES?

THIS PROJECT INVOLVES THE USE OF ANIMALS

PENDING **APPROVED** **IACUC PROTOCOL #**

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS?

PENDING **APPROVED** **IRB PROTOCOL #** **M**

THIS PROJECT IS SUITABLE FOR:

UNDERGRADUATE STUDENTS **ENTERING FRESHMAN**
SOPHOMORES **ALL STUDENTS**

THIS PROJECT IS WORK-STUDY: **Yes** **or** **No**

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR

FOR INTERESTED VOLUNTEERS: **Yes** **or** **No**

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?

Scientific methodology, clinical exposure to surgery