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Engineering & Scientific Consulting

Sheng Chen, Ph.D.

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Professional Profile

Dr. Chen's areas of expertise include solid mechanics, soft tissue biomechanics, experimental testing, and computational modeling. He has applied his knowledge to evaluate the biomechanics of soft tissue and potential for soft tissue injuries. Specifically, Dr. Chen has applied his experimental skills to collect soft tissue mechanical behavioral data from tensile tests and soft tissue microstructural data from image analyses.

Dr. Chen has also utilized his computational skills to model human soft tissue response to mechanical loading under different scenarios to investigate its nonlinear anisotropic behavior, and further to better understand injury mechanisms related to pressure ulcers and childbirth.

Prior to joining Exponent, Dr. Chen was a Postdoctoral Research Associate in the Mechanical Engineering and Biomedical Engineering Departments at Michigan State University. During this time, Dr. Chen used a multibody dynamic modeling approach to investigate neonatal birth injuries like brachial plexus palsy. He also developed biofidelic computational models to better understand maternal birth injuries like pelvic floor injuries and coccyx pain.

Dr. Chen has over 10 years of experience in original research, publishing papers, and presenting research at conferences. Dr. Chen also has expertise in study design, protocol development, statistical analysis, and computational programming.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Michigan State University, 2019

M.S., Mechanical Engineering, Beijing Jiaotong University, 2014

B.S., Mechanical Engineering, Beijing Jiaotong University, 2011

Academic Appointments

Teaching Assistant, Mechanical Engineering, Michigan State University, 2014 – 2015

Prior Experience

Postdoctoral Research Associate, Michigan State University, 2019 – 2021.

Professional Affiliations

Biomedical Engineering Society (BMES)

Publications

Chen S, Grimm MJ. Childbirth computational models: characteristics and applications. Journal of Biomechanical Engineering 2021; 143(5):050801.

Chen S, Scott J, Bush TR, Roccabianca S. Inverse finite element characterization of the human thigh soft tissue in the seated position. Biomechanics and Modeling in Mechanobiology 2020; 19(1):305–316.

Chen S, Ní Annaidh A, Roccabianca S. A microstructurally inspired constitutive model for skin mechanics. Biomechanics and Modeling in Mechanobiology 2020; 19(1):275–289.

Scott J, Chen S, Roccabianca S, Bush TR. The effects of body position on the material properties of soft tissue in the human thigh. Journal of the Mechanical Behavior of Biomedical Materials 2020; 110:103964.

Upchurch DA, Wang Y, Chen S, Roccabianca S, Roush JK. Assessment of time to completion, number of errors, and knot-holding capacity of square knots and Aberdeen knots tied by veterinary students and student perceptions of knot security and knot-tying difficulty. Journal of the American Veterinary Medical Association 2020; 256(2):230–238.

Sadler Z, Scott J, Drost J, Chen S, Roccabianca S, Bush TR. Initial estimation of the in vivo material properties of the seated human buttocks and thighs. International Journal of Non-Linear Mechanics 2018; 107:77–85.

Bula E, Upchurch DA, Wang Y, Chen S, Roccabianca S. Comparison of tensile strength and time to closure between an intermittent Aberdeen suture pattern and conventional methods of closure for the body wall of dogs. American Journal of Veterinary Research 2017; 79(1):115–123.

Presentations

Chen S, Routzong M, Abramowitch S, Grimm MJ. Modeling of childbirth – coccyx rotation with improved biofidelity of fetal head and delivery path. Biomedical Engineering Society (BMES) Annual Meeting, Orlando, FL, 2021.

Chen S, Routzong M, Abramowitch S, Grimm MJ. The effects of fetal head size on maternal coccyx rotation during a vaginal delivery. Summer Biomechanics, Bioengineering, Biotransport Conference (SB3C), virtual, 2021.

Chen S, Grimm MJ. Reducing delivery force and brachial plexus stretch during shoulder dystocia by combined maneuvers. Biomedical Engineering Society (BMES) Annual Meeting, virtual, 2020.

Chen S, Grimm MJ. A computational study of effects of commonly used obstetrical maneuvers on fetal brachial plexus stretch during a shoulder dystocia event. Summer Biomechanics, Bioengineering, Biotransport Conference (SB3C), virtual, 2020.

Chen S, Broemer E, Scott J, Bush TR, Roccabianca S. A nonlinear finite element model of human thigh with high anatomical and mechanical fidelity”. Engineering Graduate Research Symposium, East Lansing, MI, 2019.

Chen S, Broemer E, Scott J, Bush TR, Roccabianca S. Development and validation of a nonlinear human thigh finite element model. Midwest American Society of Biomechanics (ASB) Regional Meeting, Dayton, OH, 2019.

Chen S, Scott J, Bush TR, Roccabianca S. Non-linear finite element model of thigh soft tissue mechanical behavior informed by in vivo experimental data. Biomedical Engineering Society (BMES) Annual Meeting, Atlanta, GA, 2018.

Chen S, Scott J, Bush TR, Roccabianca S. A subject specific model of the human thigh informed by in vivo experimental data. 8th World Congress of Biomechanics, Dublin, Ireland, 2018.

Chen S, Scott J, Bush TR, Roccabianca S. Determination of the proper constitutive model for a subject specific FE model of the human thigh. Engineering Graduate Research Symposium, East Lansing, MI, 2018.

Chen S, Scott J, Bush TR, Roccabianca S. A subject specific model of the human thigh informed by in vivo experimental data. ICHITA-WM IT Forum Joint Conference, Kalamazoo, MI, 2017.

Chen S, Roccabianca S. Determination of proper storage condition and constitutive model for rat back skin mechanical properties. Summer Biomechanics, Bioengineering, Biotransport Conference (SB3C), Tucson, AZ, 2017.

Chen S, Roccabianca S. Effect of storage condition, orientation, location and gender on rat back skin mechanical properties. Engineering Graduate Research Symposium, East Lansing, MI, 2017.

Chen S, Roccabianca S. Effect of storage condition, orientation, location and gender on rat back skin mechanical properties. 9th Annual Graduate Academic Conference, East Lansing, MI, 2017.

Chen S, Roccabianca S. Effect of storage condition, orientation, location and gender on rat back skin mechanical properties. Midwest American Society of Biomechanics (ASB) regional meeting, Grand Rapids, MI, 2017.

Chen S, Ní Annaidh A, Roccabianca S. Micro-structurally motivated constitutive model for human skin. Summer Biomechanics, Bioengineering, Biotransport Conference (SB3C), National Harbor, MD, 2016.

Chen S, Ní Annaidh A, Roccabianca S. Micro-structurally motivated constitutive model for human skin. Engineering Graduate Research Symposium, East Lansing, MI, 2016.

Peer Reviews

Journal of Biomedical Engineering