Exponent®
Engineering & Scientific Consulting

Jessica Isaacs, Ph.D., P.E.

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Professional Profile

Dr. Isaacs has a multidisciplinary background in biomechanics, materials science and engineering, and mechanical engineering. At Exponent, she specializes in evaluating injury mechanisms and risk in a variety of contexts, including motor vehicle collisions, construction accidents, occupational accidents, and recreational events. Her expertise spans from injury causation analysis in low-energy impacts to biomechanical evaluation of product design and performance.

Dr. Isaacs has conducted testing to evaluate kinematics and kinetics across a range of scenarios, including spinal testing, component-level evaluations using anthropomorphic test devices (ATDs), and full-scale automotive crash and sled tests. She has published and presented research on occupational and automotive injuries, spine biomechanics, and sports-related trauma.

Her prior research focused on spine biomechanics, particularly the effects of degeneration and aging on the intervertebral disc, as well as the development of injectable hydrogels. Dr. Isaacs was awarded a Fulbright Fellowship at Tel Aviv University, where she investigated computational biomechanical models for diagnosis and management of lumbar spine pathologies and studied fiber-reinforced bio-composite materials.

Before joining Exponent, Dr. Isaacs served as a visiting assistant professor in the mechanical engineering department at Widener University. There, she taught undergraduate engineering courses, advised student chapters of the Society of Automotive Engineers and Engineers without Borders, and participated in numerous STEM outreach initiatives.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering and Mechanics, Drexel University, 2012

M.S., Mechanical Engineering and Mechanics, Drexel University, 2009

B.S., Mechanical Engineering, Widener University, 2006

ASME Nominee New Faces of Engineering, 2015

Fulbright Scholar, Tel Aviv University, 2012-2013

United States Department of Education GAANN Fellow, 2007-2011

Widener University's Service and Leadership Award, 2006

Tau Beta Pi Honor Society

Licenses and Certifications

Professional Engineer Mechanical, Delaware, #21997

Academic Appointments

Visiting Assistant Professor, Mechanical Engineering Department, Widener University, 2013-2015

Post-doctoral Appointment, Mechanical Engineering Department, Tel Aviv University, 2012-2013

Professional Affiliations

American Society of Mechanical Engineers (member)

ASTM International, F-27 Snow and Water Sports (member)

Biomedical Engineering Society (member)

Publications

Isaacs JL, George J, Campolettano E, Cutcliffe H, Miller B. “The role of three-point restraints for occupants in moderate severity frontal collisions.” Society of Automotive Engineers (SAE) Technical Paper 2022-01-0845, 2022

Toney Bolger M, Isaacs JL, Rapp van Roden E, Croteau J, Dibb A. “Seat belt latch plate design and pretensioner deployment strategies have limited effect on in- and out-of-position occupants in high-severity rear-end collisions.” SAE Technical Paper 2022-01-0849, 2022

Croteau J, Toney Bolger M, Isaacs JL, Shurtz B, Zolock J. “Seatback strength and its effect on in-position and out-of-position atd loading in high-speed rear impact sled tests.” SAE Technical Paper 2022-01-0856, 2022

Isaacs JL, Campbell IC, Watson H, Toney Bolger ME. "Head and neck loading trends in IIHS side impact testing." Topic Key Note Presentation/Paper, Fédération Internationale des Sociétés d'Ingénieurs des Techniques de l'Automobile (FISITA) World Congress, Prague, Czech Republic (virtual), September 14-16, 2021. Outstanding Paper Award

Toney Bolger M, Sherman S, Isaacs JL, Garman C, Dibb A. “An evaluation of near- and far-side occupant responses to low- to moderate-speed side impacts.” SAE Technical Paper 2020-01-1218, 2020

Davis MS, Isaacs JL, Graber MA, Fisher JL. “Thoracic spine extension injuries in occupants with pre-existing conditions during rear end collisions.” SAE Technical Paper 2019-01-1222, 2019

Scanlon JM, Isaacs JL, Garman CMR. “Head and neck loading conditions over a decade of IIHS rear impact seat testing.” SAE Technical Paper 2019-01-1227, 2019

Sharabi M, Benayahu D, Benayahu Y, Isaacs JL, Haj-Ali R. “Laminated collagen-fiber bio-composites for soft-tissue bio-mimetics.” Composites Science and Technology, 2015; 117:268-276.

Isaacs JL, Vresilovic E, Sarkar S, Marcolongo M. “Role of biomolecules on annulus fibrosus mechanics: Effect of enzymatic digestion on micromechanics.” Journal of the Mechanical Behavior of Biomedical Materials, 2014; 40:75-84.

Cannella M, Isaacs JL, Allen S, Orana A, Vresilovic E, Marcolongo M. Nucleus Implantation: “The biomechanics of augmentation versus replacement with varying degrees of nucleotomy.” Journal of Biomechanical Engineering, 2014; 136(5).

Isaacs JL. “Micromechanics of the annulus fibrosus: Role of biomolecules in mechanical function.” Doctoral Dissertation, Drexel University, 2012.

Invited Talks

"The Automated Vehicle User Experience." Panel Discussion, FISITA World Congress, Barcelona, Spain, June 5, 2025.

"How my Career ended up in Failure." ASME FutureME Presentation, International Mechanical Engineering Congress & Exposition (IMECE), Pittsburgh, PA, November 11, 2018.

Selected Presentations and Published Abstracts

Isaacs JL, Mortensen J, O’Brien K, Imler S. "Wearable Devices can Detect Differences in Alpine Ski Ability." Podium Presentation, International Society of Snowsports Safety (ISSS) / Société Internationale de Traumatologie et de Médecine des Sports d'Hiver (SITEMSH) Congress, Kranjska Gora, Slovenia, March 10-16, 2024.

Isaacs JL, Toney Bolger ME, Campbell IC. "Cervical spine loading during asymmetrical non-injurious physical activities." Podium Presentation, XXVII Congress of the International Society of Biomechanics (ISB) /43rd Annual Meeting of the American Society of Biomechanics (ASB), Calgary, Canada, July 31 - August 4, 2019.

Davis MS, Isaacs JL, Graber MA, Fisher JL. "Thoracic spine extension injuries in occupants with pre existing conditions during rear-end collisions." Podium Presentation, IMECE, Pittsburgh, PA, November 11-15, 2018.

Isaacs JL, Bellezza A, Brown, V. "Sports concept design: An entrepreneurial co- and extra-curricular activity." Podium Presentation, Spring 2015 Mid-Atlantic American Society for Engineering Education (ASEE) Conference, Villanova, PA, April 2015.

Isaacs JL, Binetti V, Lowman A, Marcolongo MS. "Testing methods for evaluation of injectable nucleus replacement." Podium Presentation, Philadelphia Spine Research Symposium, Philadelphia, PA, October 2014.

Isaacs JL, Vresilovic E, Marcolongo MS. "Role of biomolecules on cross-ply mechanics of annulus fibrosus." Podium Presentation, Society for Biomaterials Meeting (SFB), Orlando FL, April 2011. STAR (Student Travel Award Recognition) Honorable Mention

Isaacs JL, Vresilovic E, Marcolongo MS. "Micromechanical characterization of Annulus Fibrosus Lamellar." Poster Presentation, SFB, Orlando, FL, April 2011.

Selected Poster Presentations

Mattucci M, Jendrus J, Angelucci M, Neidert J, Mauger J, Isaacs JL. "Posterior vertebral fixation: Screw-to-screw cross-connection concept investigation." Poster Presentation, Biomedical Engineering Society (BMES) 2015 Annual Meeting, Tampa, FL, October 7-10, 2015.

Isaacs JL, Binetti V, Lowman A, Marcolongo MS. "Test methodology of characterizing the behavior of injectable hydrogels: An in vitro model." Poster Presentation, SFB, Charlotte, NC, April 2015.

Isaacs JL, Vresilovic E, Marcolongo MS. "Role of macromolecules on micromechanics of the annulus fibrosus." Poster Presentation, Orthopedic Research Society Meeting (ORS), San Francisco, CA, February 2012.

Isaacs JL, Vresilovic E, Marcolongo MS. "What role does macromolecules play in annular mechanics?" Poster Presentation, Philadelphia Spine Research Society International Meeting, Philadelphia, PA, December 2011. Best Poster Award: Biomechanics and Imaging.

Isaacs JL, Vresilovic E, Marcolongo MS. "Role of biomolecules on circumferential mechanics of the annulus fibrosus." Poster and Podium Presentations, International Society for the Study of the Lumbar Spine Meeting (ISSLS), Gothenburg, Sweden, June 2011. Distinguished Poster Award.

Isaacs JL, Vresilovic E, Marcolongo MS. "Enzymatic digestion effects on mechanics of radial annulus fibrosus samples." Poster Presentation, ORS, Long Beach, CA, January 2011.

Isaacs JL, Bonfiglio D, Gidvani S, Vresilovic E, Marcolongo MS. "Effect of enzymatic digestion on mechanics of in-plane annulus fibrosus lamellae." Poster Presentation, ORS, New Orleans, LA, March 2010.

Isaacs JL, Gidvani S, Sarkar S, Bonfiglio D, Vresilovic E, Doehring T, Marcolongo MS. "The role of macromolecular components in the micromechanics of the annulus fibrosus." Poster Presentation, SFB), San Antonio, TX, April 2009.

Isaacs JL, Gidvani S, Sarkar S, Bonfiglio D, Vresilovic E, Doehring T, Marcolongo MS. "Toward a model of intervertebral disc herniation using normal and degenerative failure criteria based on annulus fibrosus laminar micromechanics." Poster Presentation, Philadelphia Spine Research Symposium, Philadelphia, PA, November 2008.