



205 NE Northlake Way
Suite 100
Seattle, WA 98105
+1 206.906.9090



GuidanceEngineering.com

LENKA STEPAN, PHD

Biomechanics Principal

Dr. Lenka Stepan is a Biomechanics Principal specializing in injury biomechanics and accident reconstruction at Guidance Engineering and Applied Research. Dr. Stepan analyzes human injuries and reconstructs accidents using biomechanical techniques that apply principles of engineering to the human body. For accidents and product failures, she determines the biomechanical mechanisms of injury, uses injuries as physical evidence to reconstruct the events, and examines the forces and motions in the context of those experienced during non-injurious activities. In addition, Dr. Stepan has investigated injury potential using anthropometric testing devices (crash test dummies), computer modeling, and statistical techniques. Dr. Stepan has conducted biomechanical analyses for injury claims arising from recreational activities (such as skiing, snowboarding, snow tubing, mountain biking, wakeboarding, waterskiing, ATVs, snowmobiling, etc.), slip/trip and falls, product failures, motor vehicle accidents, maritime accidents, and heavy equipment operation.

Dr. Stepan is actively involved in sport safety research including examining the efficacy of helmets for snow and water sports, ski area padding, skier speeds and reaction times, terrain park jumps, ski lift loading and unloading, and restraint bar use. Dr. Stepan is the USA National Secretary of the International Society for Skiing Safety and a member of ASTM F27 for Snow and Water Sports and ASTM F08 on Sports Equipment, Playing Surfaces and Facilities. Prior to starting at Guidance Engineering, Dr. Stepan was a Senior Associate at Exponent Failure Analysis Associates and a Research Scientist at Physical Optics Corporation.

Academic Credentials

Ph.D., Biomedical Engineering, University of California, Los Angeles, 2007

M.S., Biomedical Engineering, University of California, Los Angeles, 2006

B.S., Bioengineering, University of California, Berkeley, 2000

Publications

Stepan L, Scher I, Ruedl G, Shealy J. Skier and snowboarder speeds at US ski areas. *Journal of Science and Medicine in Sport Plus*. 2023, 2. (doi:10.1016/j.jsampl.2023.100033)

Suderman B, Stepan L, Scher I. Examining differences in kinematics and boat loading patterns in towed water sports. *Sports Engineering*, 2023, 26-38. (doi:10.1007/s12283-023-00432-6)

Harley E, Stepan L, Scher I. Factors that influence chairlift restraint bar use in the United States. *Journal of Science and Medicine in Sport Plus*, 2023, 2. (doi: 10.1016/j.jsampl.2023.100031)

Scher I, Stepan L, Shealy J, Stoddard C. At the end of a slippery slope: A pilot study of deceleration mats for snow tubing. *Applied Science*, 2021, 11, 10501.

Scher I, Witchalls J, Nachbauer W, Stepan L. Snowsport trauma and safety: Opportunities to make snowsports safer. *Journal of Science and Medicine in Sport*, 2021, 24, 1002-1003.

Scher I, Stepan L, Shealy J, Hoover R. Examining ski area padding for head and neck injury mitigation. *Journal of Science and Medicine in Sport*, 2020.

Harley E, Stepan L, Scher I. An observational study of skier compliance with posted “slow” signs and ski patrollers. *Journal of Science and Medicine in Sport*, 2020.

Zhu H, Scher I, Stepan L, Shen I. Method to examine how geometry affects the release and retention of alpine touring boot-binding systems. *Journal of Science and Medicine in Sport*, 2020

Scher I, Stepan L, Hoover R. Head and neck injury potential during water sports falls: examining the effects of helmets. *Sports Engineering* 2020, 23(7), 1-10.

Cruise D, Suderman B, Yang N, Stepan L, Scher I. The Effect of Changing Vehicle Seat Stiffness: A MADYMO Sensitivity Analysis. SAE Technical Paper 2020-01-0524, Society of Automotive Engineers, Inc. Warrendale, PA, 2020.

Suderman B, Cruise D, Yang N, Lau E, Stepan L, Scher I. Low-Energy Seat Compression: Characterizing Stiffness in Different Vehicles. SAE Technical Paper 2020-01-0527, Society of Automotive Engineers, Inc. Warrendale, PA, 2020.

Scher I, Stepan L, Campbell J, Gunnarson C, Bower G, Wilkens K, Hackett T. Dynamics of snow park jump landings: A pilot study examining impact loads for elite athletes. In: Müller E, Kröll J, *et al.*, eds. *Science and Skiing VII — Proceedings of the 7th International Congress on Science and Skiing (ICSS)*. Maidenhead, UK: Meyer & Meyer Sport (UK) Ltd, 2018, pp. 310-319.

Campbell J, Scher I, Stepan L, Campbell K, Nichol J, Ching R. Ski binding loads generated during alpine skiing and alpine touring skiing: a comparison of the retention requirements. In: Müller E, Kröll J, *et al.*, eds. *Science and Skiing VII — Proceedings of the 7th International Congress on Science and Skiing (ICSS)*. Maidenhead, UK: Meyer & Meyer Sport (UK) Ltd, 2018, pp. 323-331.

Scher I, Shealy J, Stepan L, Thomas R, Hoover R. Terrain Park Jump Design: Would Limiting Equivalent Fall Height Reduce Spine Injuries? *Skiing Trauma and Safety*, 20th Volume, ASTM STP 1582, 2015.

Shealy J, Scher I, Stepan L, Harley E. Jumper kinematics on terrain park jumps: Relationship between takeoff speed and distance traveled. *Journal of ASTM International*. 2010. 7(10) (Paper ID JAI102885)

Harley E, Scher I, Stepan L, Young D, Shealy J. Reaction times of skiers and snowboarders. *Journal of ASTM International*. 2010. 7(9) (Paper ID JAI102829)



Stepan L, Levi D, Gans E, Mohanchandra K, Ujihara M, Carman G. Biocorrosion investigation of two shape memory nickel based alloys: Ni-Mn-Ga and thin film nitinol. *Journal of Biomedical Materials Research: Part A*. 2007. 82(3): 768-776

Stepan L, Levi D, Carman G. A thin film nitinol heart valve. *Journal of Biomechanical Engineering*. 2005. 127(6): 915-918

Levi D, Raff E, Stepan L, Liu J, Williams R, Moore J, Carman G. Use of a covered stent modification to produce a transcatheter valve: Laboratory and animal testing, *ASAIO J*. 2005. 51(6): 719-24

Published Abstracts and Conference Presentations

Harley E, Stepan L, Scher I, and Shealy J. Factors that influence chairlift restraint bar use in the United States. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Serre-Chevalier Vallée, France, March 2022.

Shealy J, Scher I, and Stepan L. Analysis of death in snowsports from 1974 through 2019. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Serre-Chevalier Vallée, France, March 2022.

Suderman B, Sklar A, Stepan L, Scher I. Water ski binding release characteristics in forward lean. ISEA 2020 The Engineering of Sport 13, June 22-26, 2020.

Scher I, Stepan L, Yang N, Shealy J. Modeling skier kinematics during falls: Examining the effect of catching an edge. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Stepan L, Scher I. Inverted impacts onto snow park air bags: Potential for severe head and neck injury. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Richards D, Yang N, Stepan L, Scher I. Can safety hurt: Examining injury potential in B-net impacts using MADYMO simulations. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Stepan L, Scher I. Quantifying snow tube deceleration techniques: A preliminary study of deceleration mats. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Lee J, Powers CM, Stepan L, Scher I. The effects of ski boots on utilized coefficient of friction and knee kinematics during walking. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Shealy J, Johnson R, Stepan L, Scher I. How many ski and snowboard injuries occur in the US per year? Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.



Harley E, Stepan L, Scher I. A controlled study of skier compliance with posted “SLOW” signs and ski patrollers. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Cruise DR, Suderman B, Stepan L, Scher I. An epidemiological study of mountain biking injuries treated in emergency departments in the United States. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Stepan L, Scher I, Shealy J. Skiing and snowboarding related emergency department visits in California. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Zhu H, Scher I, Stepan L, Shen IY. Geometric considerations for alpine touring tech/pin systems. Abstract presented at the biennial meeting of the International Society for Snowsport Safety, Squaw Valley, California, USA, April 2019.

Yang N, Stepan L, Suderman B, Scher I. Does a rotating bar affect the body kinematics during a penny drop maneuver? Abstract presented at the 42nd annual meeting of the American Society of Biomechanics, Rochester, Minnesota, August 2018.

Shealy J, Scher I, Johnson R, Stepan L. Can helmets prevent death in snowsports? Presented at the biennial meeting of the International Extreme Sports Medicine Congress, Boulder, Colorado, June 2018.

Stepan L, Scher I. Effectiveness of Ski Area Padding: Potential for Head and Neck Injury Mitigation. Abstract presented at the 22nd Congress of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Stepan L, Suderman B, Scher I, Shealy J. Skiing and Snowboarding Fatalities: Are Head Injuries Overrepresented as a Cause of Death? Abstract presented at the 22nd Congress of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Scher I, Stepan L, Campbell J, Gunnarson C, Bower G, Wilkens K, Hackett T. Snow park jump landings: A pilot study of impact loads. Abstract presented at the biennial meeting of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Campbell J, Stepan L, Scher I. Release of Alpine Touring Bindings in Tour Mode. Abstract presented at the 22nd Congress of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Campbell J, Scher I, Stepan L, Ching R. Retention and Release Loads Measured on Alpine and Alpine Touring Bindings. Abstract presented at the 22nd Congress of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Campbell J, Stepan L, Scher I, Ching R. Knee Joint Loads in Male and Female Skiers. Abstract presented at the 22nd Congress of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.



Shealy J, Scher I, Johnson R, Stepan L, Campbell K. Can helmets prevent death to skiers and snowboarders? Abstract presented at the biennial meeting of the International Society for Skiing Safety, Innsbruck, Austria, April 2017.

Scher I, Stepan L, Campbell J, Gunnarson C, Bower G, Wilkens K, Hackett T. Snow Park Jump Landings: A Pilot Study Examining Impact Loads. International Olympic Committee World Conference on Prevention of Injury & Illness in Sport, Monte-Carlo, Monaco, March 2017.

Scher I, Stepan L, Campbell J, Gunnarson C, Bower G, Hackett T. Dynamics of Snow Park Jump Landings: A Pilot Study Examining Impact Loads. Abstract presented at the 7th International Congress on Science and Skiing, St. Christoph a. Arlberg, Austria, December 2016.

Campbell J, Scher I, Stepan L, Campbell K, Nichol J, Ching R. Ski binding loads generated during alpine skiing and alpine touring skiing: a comparison of the retention requirements. Abstract presented at the 7th International Congress on Science and Skiing, St. Christoph a. Arlberg, Austria, December 2016.

Scher I, Stepan L, Yang N, Shealy J. Head Injuries from Snow Park Jumps. Presented at the Biennial Meeting of the International Extreme Sports Medicine Congress, Boulder, Colorado, June 2016.

Scher I, Stepan L, Yang N, Shealy J. Rotational Head Kinematics During a Back Edge Catch Event. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Scher I, Suderman B, Stepan L, Shealy J. Helmet Effectiveness: Do Helmets Reduce the Likelihood of Severe Head Injury? Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Shealy J, Scher I, Stepan L, Shealy K. Fatalities in skiing and snowboarding in the United States. Abstract presented at the biennial meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Stepan L, Scher I, Shealy J. Typical Skiing and Snowboarding Speeds at US Ski Resorts. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Stepan L, Scher I, Harley E, Shealy J. Chairlift Restraining Bar Usage: A Pilot Study at a US Western Ski Resort. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Shealy J, Scher I, Stepan L, Shealy K. Update: Fatalities in Skiing and Snowboarding in the United States. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Vito di Cadore, Italy, March 2015.

Scher I, Shealy J, Stepan L, Thomas R, Hoover R. Terrain park jump design: Would limiting equivalent fall height reduce spine injuries? Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Carlos de Bariloche, Argentina, August 2013.



Stepan L, Scher I, Shealy J, Hoover R, Yang S. Factors contributing to severe injury in unsuccessful jumps: Modeling initial ground contact. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Carlos de Bariloche, Argentina, August 2013.

Suderman B, Harley E, Stepan L, Shealy J, Scher I. Chairlift unloading success: Effects of age and equipment type on likelihood of falling. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, San Carlos de Bariloche, Argentina, August 2013.

Scher I, Stepan L, Shealy J, Thomas R. Rental and Fleet Helmets: Examining Multiple Impacts. Abstract presented at the Biennial Meeting of the International Society for Skiing Safety, Keystone, CO, May 2011.

Stepan L, Scher I, Thomas R, Yang N. Protective capabilities of a watersports helmet for boom-to-head impacts during sailing. ASME 2010 Summer Bioengineering Conference. June 16-19, 2010. Naples, FL, USA, SBC2010-19717

Stepan L, Scher I, Shealy J. Unconstrained speeds of skiers and snowboarders: Factors influencing the in-run of a table-top jump. Abstract presented at the Biennial Meeting of the International Symposium on Skiing Trauma and Safety, Garmisch, Germany, April 2009.

Stepan L, Levi D, Carman G. A thin film nitinol heart valve. Proceedings of the 2004 ASME International Mechanical Engineering Congress 2004. November 13, 2004. Anaheim, CA, USA, ASME-IMECE 2004-60850

Levi D, Stepan L, Carman G, Jardine A. Development and testing of manufacturable thin film TiNi for medical devices. Proceedings of the SMST 2004. October 3-7, 2004, Baden-Baden, Germany

Professional Affiliations

- ASTM International
 - F27 Snow and Water Sports
 - F08 Sports Equipment, Playing Surfaces, and Facilities
- International Society for Skiing Safety
 - USA National Secretary
- Society of Automotive Engineers

Conferences Hosted

International Society for Snowsport Safety, 23rd International Congress on Ski Trauma and Skiing Safety, Squaw Valley, California, USA, April 2019.

