Exponent®
Engineering & Scientific Consulting

Christopher DiCesare, Ph.D.

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Professional Profile

Dr. DiCesare has 10+ years of research and applied experience using biomechanical analysis and data science to address practical problems at the intersection of human movement science, engineering, and healthcare. He specializes in the development of wearable and digital health products to characterize human behavior in naturalistic settings, as well as in the development and deployment of targeted computational approaches that operate at scale for health monitoring, diagnosis, injury risk stratification, and preventative and therapeutic rehabilitation.

Dr. DiCesare has expert knowledge of 3D human motion analysis, force platform and plantar pressure measurement, inertial measurement, augmented and virtual reality (AR/VR), and artificial intelligence and machine learning (AI/ML). He also has extensive experience conducting human subjects research in a variety of populations across ages.

Before joining Exponent, Dr. DiCesare was a research fellow with the Sienko Research Group in the Department of Mechanical Engineering at the University of Michigan, where he developed data-driven, wearable sensor-based applications such as personalized balance training and autonomous-driving-induced motion sickness detection. Previously, he was a biomechanist and clinical research coordinator in the Sport Performance Optimized by Research and Technology (SPORT) Center Laboratory, a pediatric biomechanics and sports medicine laboratory in the Division of Sports Medicine at Cincinnati Children's Hospital, where he investigated sensorimotor deficits that led to or resulted from acute and chronic injury in adolescent athletes. While at Children's, he worked as a programmer analyst in the Department of Environmental Health at the University of Cincinnati College of Medicine, where he collaborated with clinicians and industrial engineers to develop software to analyze gait and balance performance in adults. Dr. DiCesare has also served as an adjunct faculty member at both the undergraduate and graduate levels at Mount St. Joseph University, Xavier University, and the University of Michigan.

Academic Credentials & Professional Honors

Ph.D., Computer Science and Engineering, Miami University, 2020

M.S., Exercise and Health Studies, Miami University, 2011

B.A., Zoology, Miami University, 2009

Academic Appointments

Adjunct Faculty, Kinesiology, University of Michigan, 2021

Adjunct Faculty, Exercise Science, Xavier University, 2018-2020

Adjunct Faculty, Athletic Training, Mount St. Joseph University, 2014-2018

Prior Experience

Research Fellow, Mechanical Engineering, University of Michigan, 2020-2021

Programmer Analyst, Environmental Health, University of Cincinnati College of Medicine, 2018-2020

Biomechanist & Clinical Research Coordinator, Sports Medicine, Cincinnati Children's Hospital Medical Center, 2011-2020

Publications

(Selected from 60+ peer-reviewed publications)

Ma CZ, Bao T, DiCesare CA, Harris I, Chambers A, Shull PB, Zheng YP, Cham R, Sienko KH. Reducing slip risk: A feasibility study of gait training with semi-real-time biofeedback of foot-floor contact angle. Sensors (Basel). 2022; 22(10):3641.

Pedley JS, DiCesare CA, Lloyd RS, Oliver JL, Ford KR, Hewett TE, Myer GD. Maturity status alters drop vertical jump landing force-time profiles but not performance outcomes in adolescent females. Scand J Med Sci Sports. 2021; 31(11):2055-2063.

DiCesare CA, Green B, Yuan W, Diekfuss JA, Barber Foss KD, Dudley J, Qin Y, Wang P, Myer GD. Machine learning classification of verified head impact exposure strengthens associations with brain changes. Ann Biomed Eng. 2020; 48(12):2772-2782.

Black WR, DiCesare CA, Thomas S, Pfeiffer M, Williams SE, Kitchen K, Ting TV, Myer GD, Kashikar-Zuck S. Preliminary evidence for the Fibromyalgia Integrative Training Program (FIT Teens) improving strength and movement biomechanics in juvenile fibromyalgia: Secondary analysis and results from a Pilot Randomized Clinical Trial. Clin J Pain. 2021; 37(1):51-60.

Bonnette S, DiCesare CA, Kiefer AW, Riley MA, Barber Foss KD, Thomas S, Diekfuss JA, Myer GD. A technical report on the development of a real-time visual biofeedback system to optimize motor learning and movement deficit correction. J Sports Sci Med. 2020; 19(1):84-94.

DiCesare CA, Minai AA, Riley MA, Ford KR, Hewett TE, Myer GD. Distinct coordination strategies associated with the drop vertical jump. Med Sci Sports Exerc. 2020; 52(5):1088-1098.

DiCesare CA, Montalvo A, Barber Foss KD, Thomas SM, Hewett TE, Jayanthi NA, Myer GD. Sport specialization and coordination differences in multisport adolescent female basketball, soccer, and volleyball athletes. J Athl Train. 2019; 54(10):1105-1114.

DiCesare CA, Bonnette SH, Myer GD, Kiefer AW. Differentiating successful and unsuccessful single-leg drop landing performance using uncontrolled manifold analysis. Motor Control. 2020; 24(1):75-90.
DiCesare CA, Montalvo A, Barber Foss KD, Thomas SM, Ford KR, Hewett TE, Jayanthi NA, Stracciolini A, Bell DR, Myer GD. Lower extremity biomechanics are altered across maturation in sport-specialized female adolescent athletes. Front Pediatr. 2019; 7(268).

Shams K, DiCesare CA, Grawe BM, Wall E, Parikh S, Galloway M, Kitchen K, Foss KB, Thomas SM, Montalvo AM, Colosimo AJ, Myer GD. Biomechanical and functional outcomes after medial patellofemoral ligament reconstruction: A pilot study. Orthop J Sport Med. 2019; 7(2).

DiCesare CA, Kiefer AW, Bonnette SH, Myer GD. High-risk lower-extremity biomechanics evaluated in simulated soccer-specific virtual environments. J Sport Rehabil. 2020; 29(3):294-300.

DiCesare CA, Kiefer AW, Nalepka PK, Myer GD. Quantification and analysis of saccadic and smooth pursuit eye movements and fixations to detect oculomotor deficits. Behav Res Methods. 2017; 49(1):258-266.

Kiefer AW, DiCesare C, Bonnette S, Kitchen K, Gadd B, Riley MA, Thomas S, Barber Foss KD, Silva P, Myer GD. Sport-specific virtual reality to identify profiles of anterior cruciate ligament injury risk during unanticipated cutting. In 2017 International Conference on Virtual Rehabilitation, Montreal, Quebec, Canada, June 19-22, 2017.

DiCesare CA, Bates NA, Barber Foss KD, Thomas SM, Wordeman SC, Sugimoto D, Roewer BD, Medina McKeon JM, Di Stasi SL, Noehren BW, Ford KR, Kiefer AW, Hewett TE, Myer GD. Reliability of 3-dimensional measures of single-leg cross drop landing across three different institutions: Implications for multi-center biomechanical and epidemiological research on ACL injury prevention. Orthop J Sport Med. 2015; 3(12).

Ford KR, DiCesare CA, Myer GD, Hewett TE. Real-time biofeedback to target risk of anterior cruciate ligament injury: A technical report for injury prevention and rehabilitation. J Sport Rehabil. May 2015(Technical Notes):2013-0138.

DiCesare CA, Bates NA, Myer GD, Hewett TE. The validity of 2-dimensional measurement of trunk angle during dynamic tasks. Int J Sports Phys Ther. 2014; 9(4):420-427.

Myer GD, Stroube BW, DiCesare CA, Brent JL, Ford KR, Heidt RS, Hewett TE. Augmented feedback supports skill transfer and reduces high-risk injury landing mechanics: A double-blind, randomized controlled laboratory study. Am J Sports Med. 2013; 41(3):669-677.

Presentations

Invited Talks

DiCesare CA, Green B. Eliminating "false positives" from head impact data: Implications for brain neuroscience. Semi-annual meeting of the University of Cincinnati Sports Analytics Collaborative, Cincinnati, Ohio, January 2019.

Myer GD, DiCesare CA, Mishra AK. Supervised machine learning of time series accelerometer data to reduce false positives in brain neuroscience. Invited talk at the Analytics Summit 2018, Center for Business Analytics, University of Cincinnati, Cincinnati, Ohio, May 2018.

DiCesare CA. The evolution of biomechanical analysis in sport and human performance. Invited talk at the weekly meeting of the University of Cincinnati Biomedical Engineering Society, Cincinnati, Ohio, February 2016.

Conference Presentations

DiCesare CA. Examining the dynamical signatures of human movement: Implications for biologically inspired adaptive robotic control. 2019 American Institute of Aeronautics and Astronautics (AIAA) Intelligent Systems Workshop, Cincinnati, Ohio, July 29-30, 2019.

DiCesare CA. Emergence of a small and consistent set of distinct coordination strategies in motor tasks. 2019 Guy Van Orden Student Research Conference, Center for Cognition, Action, and Perception, Department of Psychology, University of Cincinnati, Cincinnati, Ohio, March 29, 2019.

DiCesare CA, Montalvo A, Barber Foss KD, Thomas SM, Ford KR, Hewett TE, Jayanthi N, Stracciolini A,

Bell DR, Myer GD. Sports specialization elicits alterations in coordination and maturational biomechanics in female adolescent basketball, soccer, and volleyball athletes. ACL Retreat VIII Conference, Greensboro, North Carolina, March 14-16, 2019.

DiCesare CA, Kiefer AW, Myer GD. Characterizing neuromuscular control processes that underlie postural stabilization via a forced harmonic oscillator model: A comparison of athletes returning to play after anterior cruciate ligament reconstruction and healthy athletes. 2016 North American Society for the Psychology of Sport and Physical Activity Conference, Montreal, Quebec, Canada, June 15-18, 2016.

Project Experience

Led the planning and implementation of key phases for several large-scale human performance user studies to test and validate devices to characterize human behavior and performance, including subject recruitment, protocol development, data management, and analysis and reporting of results.

Developed and implemented key experiments and analytical processes for the development of consumer-facing physiological standards for wearable devices.

Developed novel analytical approaches for classifying different movement types and characterizing gait behavior using wearable sensors to facilitate post-surgical health monitoring in a clinical population undergoing total knee arthroplasty.

Developed a suite of biomechanical modeling, analysis, and data mining tools geared toward markerless motion capture systems to characterize athlete performance in a variety of naturalistic sport settings.

Developed data analysis and visualization dashboards to identify trends and characterize athlete performance using wearable devices to help inform data-driven decision-making for wearable selection and deployment.

Research Grants

Co-Investigator (Co-PIs: Sienko K, Stirling L, Huan X, Ojeda L, Wiens J). Adaptive Rehabilitation Policies Using Body-Worn Sensors to Enhance Balance Training. Mind, Machine and Motor Nexus (M3X), National Science Foundation ($849,445). 2021-2023.

Co-Investigator (PI: Lloyd RS; Co-Is: Oliver JL, Myer GD, Moore I). The Effects of Targeted Neuromuscular Training on Lower Limb Injury Risk Factors in Young Female Child Athletes. National Strength and Conditioning Association International Collaboration Grant ($49,060). 2019-2020.

Peer Reviews

Applied Sciences

Behavioral Research Methods

Brazilian Journal of Physical Therapy

Concussion

Gait & Posture

International Journal of Sports Physical Therapy

Journal of Adolescent Health

Journal of Athletic Training

Journal of Biomechanics

Journal of Clinical Medicine

Journal of Motor Behavior

Journal of NeuroEngineering and Rehabilitation

Journal of Sports Science and Medicine

Journal of Sport Rehabilitation

Medical Science Monitor

Physical Therapy in Sport

PLoS One

The Physician and Sportsmedicine

Sensors

Sports Health