Rebekah L. Lawrence, PT, DPT, PhD
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Contact Information

Program in Physical Therapy
Washington University School of Medicine
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Present Position

8/2022-present	Assistant Professor (investigator track) Program in Physical Therapy Washington University School of Medicine in St. Louis
8/2022-present	Assistant Professor Department of Orthopaedic Surgery Washington University School of Medicine in St. Louis

Education

8/2002-5/2006	Bachelor of Science, Health Science Bradley University, Peoria, IL
8/2006-12/2008	Doctor of Physical Therapy St. Ambrose University, Davenport, IA
1/2009-1/2010	Orthopaedic Physical Therapy Residency St. Ambrose University; Davenport, IA
5/2012-5/2018	Doctor of Philosophy, Rehabilitation Science University of Minnesota, Minneapolis, MN
5/2018-8/2022	Postdoctoral Fellowship Henry Ford Health System, Detroit, MI

Academic and Promotion History

8/2022-current	Assistant Professor Program in Physical Therapy Washington University School of Medicine in St. Louis
8/2022-current	Assistant Professor Department of Orthopaedic Surgery Washington University School of Medicine in St. Louis

Employment History

1/2009-9/2012	Physical Therapist, Rock Valley Physical Therapy; Davenport, IA
1/2015-2/2018	Physical Therapist (PRN) TRIA Orthopaedic Center; Bloomington, MN
1/2009-6/2012	Adjunct Instructor Physical Therapy Program St. Ambrose University; Davenport, IA

1/2010-6/2012	Clinical Mentor Orthopaedic Physical Therapy Residency Program St. Ambrose University; Davenport, IA
5/2012-5/2018	Research Assistant Minnesota Rehabilitation Biomechanics Laboratory Division of Rehabilitation Science University of Minnesota; Minneapolis, MN
7/2012-3/2014	Teaching Assistant Division of Physical Therapy University of Minnesota; Minneapolis, MN
9/2017-12/2022	Guest Instructor, Division of Rehabilitation Science University of Minnesota; Minneapolis, MN
5/2018-8/2022	Postdoctoral Research Fellow Bone and Joint Center Department of Orthopaedic Surgery Henry Ford Health System; Detroit, MI

Professional Licensures and Certifications

Licenses

1/2009-9/2012	Physical Therapy License #070016875, State of Illinois (inactive)
3/2009-8/2013	Physical Therapy License #004366, State of Iowa (inactive)
1/2013-12/2022	Physical Therapy License #9223, State of Minnesota (inactive)
8/2022-present	Physical Therapy License #2022030812, State of Missouri (active)

Certifications

2010	Board Certified in Orthopaedic Physical Therapy, American Board of Physical Therapy Specialists
2011	Credentialed Clinical Instructor, American Physical Therapy Association
2011	Advanced Credentialed Clinical Instructor, American Physical Therapy Association

Honors and Awards

2002-2006	Dean's List, Bradley University
2002-2006	Dean's Scholar, Bradley University
2002-2006	Bradley Fellow, Bradley University
2008	Iowa Physical Therapy Foundation Student Scholarship
2012	DPT Student Appreciation Award, St. Ambrose University
2012	New Student Academic Merit Award, Program in Rehabilitation Science, University of Minnesota
2012-2013	Florence P. Kendall Doctoral Scholarship, Foundation for Physical Therapy
2014	Physical Therapy Preceptor of the Year, University of Minnesota Physicians' Phillips Neighborhood Clinic
2015	Promotion of Doctoral Studies (PODS) II Scholarship, Foundation for Physical Therapy Research
2016	Young Investigator Award, International Society of Biomechanics Shoulder Technical Group
2016	Promotion of Doctoral Studies (PODS) II Scholarship, Foundation for Physical Therapy Research

2016-2018	Ruth L. Kirschstein National Research Service Award (F31), National Institutes of Health (NIH)
2017	Emerging Leader Alumni Award; St. Ambrose University College of Health and Human Services
2018	APTA Biomechanics SIG PhD Student Travel Award
2018	Milne-Brandenburg Award for Exceptional Research by Graduate Students in the Basic Biomedical Sciences; University of Minnesota
2018	ASB Doctoral Student Presentation Award
2019	ORS Travel Grant in Orthopaedic Research Translation
2020	APTA Biomechanics SIG Postdoc Travel Award
2024	Early Career Investigator Award in Biomechanics Research, APTA Academy of Research

Editorial and Review Responsibilities

Editorial Positions

1/2015-present	International Editorial Review Board, *Journal of Orthopaedic and Sports Physical Therapy*

Ad Hoc Manuscript Reviews

2012-present	Clinical Biomechanics
2013-present	Journal of Orthopaedic and Sports Physical Therapy
2013-present	Physical Therapy
2015	Manual Therapy
2015-present	American Journal of Sports Medicine
2015-present	Journal of Shoulder and Elbow Surgery
2016-present	Brazilian Journal of Physical Therapy
2017-present	Journal of Orthopaedic Research
2018-present	Journal of Biomechanics
2018-present	Journal of Electromyography and Kinesiology
2019-present	Journal of Applied Biomechanics
2020-present	Gait and Posture
2021-present	Orthopaedic Journal of Sports Medicine
2023-present	British Journal of Sports Medicine
2026	Royal Society Open Science

Extramural Grant Review

8/2023	Swiss National Science Foundation
3/2025	NIH NICHD Loan Repayment Program (ZHD1 DSR-R 90 1)
8/2025	Canada Foundation for Innovation (CFI46477)
1/2026	Swiss National Science Foundation
3/2026	NIH Loan Repayment Program (ZRG1 LRP-V 00)
6/2026	APTA Academy of Orthopaedics Small Grants Program

Abstract Review for National and International Meetings

2019-present	Orthopaedic Research Society Annual Meeting
2021-present	American Society of Biomechanics Annual Meeting
2024-present	International Shoulder Group, Biannual Meeting

Community Service Contributions

Washington University in St Louis *School of Medicine* Committee and Administrative Service:

7/2025-present Program Liaison, Institute for Clinical and Translational Sciences

Washington University in St Louis Committee and Administrative Service:

2024 Panelist, Junior Jumpstart

Other University Committee and Administrative Service:

2016-2017 PhD Student Representative, Director Search Committee; Division in Physical Therapy, University of Minnesota

2021-2022 Member, Postdoctoral Seminar Planning Committee; Henry Ford Health System

Service to Other Universities

2014-2023 St. Ambrose University, College of Health and Human Services Advisory Council

Community Outreach & Volunteer Service:

8/2002-5/2006 Volunteer, Loaves and Fish Ministry, First United Methods Church, Peoria, IL.
1/2003-present Volunteer donor, American Red Cross Blood Services.
10/2004 Volunteer, Easter Seals Timber Point Outdoor, Bloomington, IL.
5/2007 Volunteer, Quad Cities Special Olympics, Davenport, IA.
7/2011 Volunteer, John Deere Classic PGA Tournament, Silvis, IL.
7/2010-present Participant, Bike MS, Fundraiser for The National Multiple Sclerosis Society
8/2011-5/2012 Volunteer physical therapy consultant; Rock Ridge High School Athletics, Rockridge, IL.
8/2013-5/2016 Volunteer physical therapy preceptor, Phillips Neighborhood Pro Bono Clinic, Minneapolis, MN.
1/2013-5/2018 Volunteer, Hennepin Avenue United Methodist Church Community Meals Program, Minneapolis, MN.
11/2022-present Volunteer, Forest Park Forever, St. Louis, MO.
9/2022-9/2023 Participant, Susan G. Komen 3-Day, Chicago, IL.
10/2023-present Volunteer, PT Day of Service, Washington University, St. Louis, MO
4/2023-present Faculty volunteer, National Biomechanics Day outreach program, Washington University, St. Louis, MO
4/2024-present Volunteer, St. Louis Marathon, St. Louis, MO
2024 Volunteer, Operation Change STL, St. Louis, MO.
2024 Volunteer, Community Engagement Activities with the Center for Community Health Partnership and Research, St. Louis, MO
2024 Volunteer, First Ladies of St Louis Health Equity Seminar, Ferguson, MO
2025-present Citizen Archivist, The National Archives, Washington, DC

Membership in Professional Societies

2006-present American Physical Therapy Association
2006-2012 Iowa Physical Therapy Association
2009-present Academy of Orthopaedic Physical Therapy
2009-2012 American Academy of Orthopaedic and Manual Physical Therapists
2010-present Academy of Research
2012-2018 Minnesota Physical Therapy Association
2013-present International Society of Biomechanics
2013-present Shoulder Technical Group
2015-present Orthopaedic Research Society
2018-2022 Michigan Physical Therapy Association

2018-present American Society of Biomechanics
2022-present Missouri Physical Therapy Association

National Panels, Committees, Boards
Academy of Orthopaedics, APTA
6/2025-present Research Committee, CSM Abstract Review Work Group

Academy of Research, APTA
5/2026-present Biomechanics SIG Nominating Committee

National Conference Symposium Chair (Proposal Development and Chair of Session)
APTA Combined Sections Meeting
2/2014 Shoulder Impingement Revisited: Evolution in Diagnostic Understanding in PT and Orthopaedic Surgery. Las Vegas, NV.
2/2020 From Cellular to Joint Mechanics: Evidence for the Multi-Factorial Etiology of Rotator Cuff Disease. Denver, CO.
2/2024 Running a Research Lab Is Like Running a Small Business. Boston, MA.
2/2026 Enhancing the Value of PT in the Management of Glenohumeral Osteoarthritis: Evidence, Controversies, and Innovations." Anaheim, CA.
2/2026 Academy of Orthopaedic Research Platforms. Anaheim, CA.

Orthopaedic Research Society Annual Meeting
3/2026 Rotator Cuff and Labrum Pathology. Charlotte, NC.

International Conference Symposium Chair (Proposal Development and Chair of Session)
International Shoulder Group
5/2024 Undergraduate & MSc Awards Session. Toronto, Ontario.

Teaching

Major External Invited Presentations, including Professorships and Lectures
9/2017 "Shoulder Biomechanics, the Right-Hand Rule, and Other Lessons Learned Along the Way." Physical Therapy Program, St. Ambrose University. Davenport, IA.

10/2017 "Biomechanics Updates Applied to the Aging Shoulder." OrthoRehab Specialists, Inc. Minneapolis, MN.

8/2018 "The Effect of Decreased Scapulothoracic Upward Rotation on Subacromial Proximities." Physical Therapy Program, Wayne State University. Detroit, MI.

11/2019 "Investigating the Multi-Factorial Etiology of Rotator Cuff Pathology." Department of Biomedical Engineering. Wayne State University. Detroit, MI.

1/2020 "Mechanical Rotator Cuff Impingement: Biomechanical Considerations in Rehabilitation." Department of Physical Therapy. University of Illinois at Chicago. Chicago, IL.

5/2020 "Paradigm Shifts in Rotator Cuff Impingement: Implications for the Movement System." Program in Physical Therapy, Movement System Clinical Fellowship Symposium. Washington University in St. Louis; St. Louis, MO (virtual).

10/2020 "Evidence for the Multi-Factorial Etiology of Rotator Cuff Pathology: Implications for the Physical Therapy Profession." Program in Physical Therapy, Shirley Sahrmann Lectureship. Washington University in St. Louis; St. Louis, MO (virtual).

4/2023 "From the clinic to the lab: Striving to improve outcomes for individuals with shoulder pain through biomechanics research." Research in Engineering, Healthcare, and Biomechanics (REHAB). University of Wisconsin-Milwaukee (virtual).

6/2024 "Investigating the Multifactorial Etiology of Rotator Cuff Tears". Department of Mechanical and Materials Engineering. Queen's University; Kingston, ON.

11/2025 Investigating the Mechanics of Shoulder Pathologies and Lessons Learned Along the Way. Program in Movement Science. Arcadia University (virtual).

Washington University Presentations & Lectures

5/2024 "Investigating the Multifactorial Etiology of Rotator Cuff Tears". Avioli Seminar, Musculoskeletal Research Center.

5/2026 "Rethinking Glenohumeral Joint Mechanics: Implications for Investigating Degenerative Shoulder Pathologies." Washington University Program in Physical Therapy Seminar.

Internal Presentations & Lectures at University:

4/2022 "Paradigm Shifts in Rotator Cuff Impingement: Implications for Physical Therapists." Henry Ford Rehabilitation, Henry Ford Health System. Wyandotte, MI.

7/2022 "Funding Your Postdoc: Preparing NIH F32 and K99/R00 Applications." Postdoc Seminar Series. Henry Ford Health System. Detroit, MI.

Courses

Graduate Entry-Level DPT

1/2009-5/2012 Lab Assistant. Musculoskeletal Therapeutics I. Physical Therapy Program, St. Ambrose University. 15 learners.

1/2009-5/2012 Lab Assistant. Musculoskeletal Therapeutics II. Physical Therapy Program, St. Ambrose University. 15 learners.

10/2010-5/2012 Adjunct Instructor. Physical Therapy Procedures I. Physical Therapy Program, St. Ambrose University. 30 learners.

9/2011-5/2012 Lab Assistant. Physical Agents. Physical Therapy Program, St. Ambrose University. 15 learners.

8/2012-12/2013 Graduate Teaching Assistant. Musculoskeletal Therapeutics I. Division of Physical Therapy, University of Minnesota. 50 learners.

1/2013-3/2014 Graduate Teaching Assistant. Musculoskeletal Therapeutics II. Division of Physical Therapy, University of Minnesota. 50 learners.

7/2012-8/2014 Graduate Teaching Assistant. Anatomy for Physical Therapy. Division of Physical Therapy, University of Minnesota. 50 learners.

1/2013-5/2013 Graduate Teaching Assistant. Neurorehabilitation. Division of Physical Therapy, University of Minnesota. 50 learners.

8/2022-present Coach. Master Adaptive Learner Coaching program. Program in Physical Therapy, WUSM, 5 learners.

1/2023-5/2023 Advisor/Content Expert. DEI III. Program in Physical Therapy, WUSM. 15-20 learners.

1/2024-present	Content Expert/Lecturer. Module 4B - Movement and Precision. Program in Physical Therapy, WUSM. 85-95 learners.
3/2024-present	Content Expert/Discussant. Module 8 – Practice, Health and Equity. Program in Physical Therapy, WUSM. 20-25 learners.
8/2025-preent	Content Expert/Lecturer. Module 5 - Prevention, Diagnosis and Management of Movement Problems. Program in Physical Therapy, WUSM. 85-95 learners.

Graduate (PhD)

9/2017-12/2023	Guest Lecturer, Advanced Biomechanics I – Kinematics. Division of Rehabilitation Science, University of Minnesota. 8-12 learners.
9/2022-present	Content Expert/Discussant. Program Seminar, Movement Science PhD Program, WUSM. 3-5 learners.
9/2023-present	Content Expert/Lecturer. Movement Science II – Biomechanics. Movement Science PhD Program, WUSM, 3-4 learners.

<u>Continuing Professional Education</u>

1/2010	Co-instructor. An Evidence-Based Approach to the Examination, Assessment, and Treatment of the Knee. Rock Valley Physical Therapy; Moline, IL.
3/2010	Lab Assistant. A Case-Based Approach to the Upper Quadrant. Physical Therapy Department, St. Ambrose University; Davenport, IA.
3/2011	Lab Assistant. A Case-Based Approach to the Lower Quadrant. Physical Therapy Department, St. Ambrose University; Davenport, IA.
1/2013	Lab Assistant. Manual Therapy I: Differentiation and Intervention in Musculoskeletal Practice. Physical Therapy Department, St. Ambrose University; Davenport, IA.
11/2014	Co-Instructor. The Aging Shoulder. Minnesota Chapter of the American Physical Therapy Association; Minneapolis, MN.
10/2015	Co-Instructor. Integration of Biomechanics and Movement Classification in the Shoulder Region. Sanford Health; Fargo, ND.
9/2016	Co-Instructor. Integration of Biomechanics and Movement System Classification in Diagnosis & Treatment for Shoulder Pain & Dysfunction. University of Minnesota; Minneapolis, MN.
10/2016	Co-Instructor. Integration of Biomechanics and Movement System Classification in Diagnosis & Treatment for Shoulder Pain & Dysfunction. St. Ambrose University; Davenport, IA.
6/2023	Instructor. The Effect of Altered Scapular Kinematics on Mechanisms of Rotator Cuff Injury. Nexus Motion (virtual webinar).
5/2026	Instructor. Pivotal Link: The Clavicle's Essential Contribution to Shoulder Function. Nexus Motion (virtual webinar).

Mentorship & Sponsorship Record

Served as **faculty research mentor and/or sponsor** for:

a) Undergraduate Students

Name (major)	Years	Reason	Outcome
Lydia Nicholson (Biomedical Engineering)	2023-2026	Research assistantship	2 national/international conference abstracts, 3 local conference abstracts
Sarah Baldwin (Biology)	2023-2026	Research assistantship	2 local conference abstracts
Nicholas Seifried (Neuroscience, Applied and Computational Mathematics and Statistics)	2023-2025	Research assistantship	1 national conference abstract, 1 local conference abstract
Connor Dechiro (Biology, pre-med)	2024-2026	Research assistantship	1 national conference abstract, 2 local poster presentations
Brooklin Sachs (Biomedical Engineering)	2025-present	Research assistantship	Pending
Libby Coltea (Biology, pre-med)	2026-present	Research assistantship	Pending

b) Medical Students

Name	Years	Reason	Outcome
Lane McCoy	2015-present	Premed research experience	Pending

c) Residents

Name	Years	Reason	Outcome
Lindsey Kahan, MD	2024-present	Residency research experience	2 conference abstracts, 1 published manuscript
Nisha Kale	2025-present	Residency research experience	1 external grant

d) Graduate Students

Name (program)	Years	Role	Outcome
Tessa Roberts, SPT (DPT)	2023	DPT research assistantship mentor	Staff physical therapist
Erin Lee, PhD (Mechanical Engineering)	2023	Mentor for visiting scholarship	2 published manuscripts, 4 conference abstracts, postdoc fellowship

Name (program)	Years	Role	Outcome
Stacey Chen, DPT (Movement Science)	2023-present	Primary PhD mentor	1 published manuscript, 5 conference abstracts, 2 PODS I Scholarships from the Foundation for Physical Therapy Research
Samantha Loudermilk, SPT (DPT)	2023-2025	DPT research assistantship mentor	
Anna Spracklin, DPT (Movement Science)	2025-present	Primary PhD mentor	1 conference abstract (won Best Poster Award)
David Hock, SPT	2025-present	DPT research assistantship mentor	Pending

Served as **career development mentor and/or sponsor** for:

a) Graduate Students

Name (program)	Years	Reason	Outcome
Jeffrey Konrad, PhD (Movement Science)	2023	PhD dissertation committee	Assistant professor, WUSM Program in Physical Therapy
Steven Solomon, SPT (DPT)	2023	Mentor for DPT synthesis project	Staff physical therapist
Christina Bourantas (Movement Science)	2024	PhD qualifying exam committee	
Lia Nocella, SPT (DPT)	2025	Mentor for DPT synthesis project	Staff physical therapist

Research

Present Extramural Grants:

1) NIH R00-AR075876 (Lawrence) 9/2022-8/2026 (NCE)
Investigating the Multi-factorial Etiology of Rotator Cuff Pathology in Human Subjects
Description: The aims of this study are to 1) extend the multivariable model developed in the K99 phase with an independent sample of asymptomatic participants; and 2) determine the extent to which shoulder pain alters the multivariable model.
Role: PI
Effort Support: 80%

2) OREF/ASES/Rockwood Shoulder Grant 25-025 (Lawrence/Zmistowski) 7/2025-6/2026
Glenohumeral joint arthrokinematics: a model for investigating eccentric OA
Description: The objectives of the study are to 1) characterize glenohumeral centering during dynamic shoulder motion in patients with eccentric glenohumeral osteoarthritis, and 2) determine the association between dynamic and traditional static measures of glenohumeral centering.
Role: Co-PI
Effort Support: 10%

3) OREF Resident Research Project Grant (Kale) 6/2025-5/2027 (NCE)
Accuracy of Low-Dose CT to Assess Glenoid Bone Loss in Shoulder Instability
Description: The objective of this study is to validate low-dose CT as a reliable and accurate diagnostic tool for assessing bone loss in patients with shoulder instability.
Role: Co-I
Effort Support: 0%

Present Intramural Grants:

1) Mallinckrodt Institute of Radiology Pilot Grant (Lawrence) 6/2026-5/2027
Accurate and Reliable Shoulder Diagnostic Imaging for Research Applications
Description: The objective of this pilot study will create a sustainable pathway for the large-scale implementation of shoulder diagnostic ultrasound at CCIR.
Role: PI
Effort Support: 0%

Pending Applications:

1) NIH R01-AR086139-A1 (Lawrence) 7/2026-6/2031
Preserving shoulder health in individuals with a degenerative rotator cuff tear
Description: The aims of this study are to: 1) Determine the factors that are associated with tear and symptom status at baseline; 2) Determine the factors that are associated with changes in symptoms and tear severity during a 2-year observation period; and 3) Determine the biomechanical factors that underly glenohumeral dynamic stability.
Role: PI
Effort Support: 50% (impact score 15, 3rd percentile)

Past Extramural Funding:

1) NIH F31-HD087069 (Lawrence) 5/2016-4/2018
Movement-related Pathogenesis of Rotator Cuff Disease in Persons with Shoulder Pain
Description: The specific aims of this study are to: 1) Determine the impact of decreased scapular upward rotation on rotator cuff compression in persons with shoulder pain; and 2) Identify the mechanisms by which sternoclavicular and acromioclavicular joint motion contribute to scapular upward rotation.
Role: PI

2) NIH K99-AR075876 (Lawrence) 9/2020-8/2022
Investigating the Multi-factorial Etiology of Rotator Cuff Pathology in Human Subjects
Description: The specific aims of the K99 phase are to: 1) Determine the extent to which extrinsic, intrinsic, and overuse factors are individually associated with rotator cuff pathology, and 2) develop a preliminary multivariable model to determine the extent to which the combination of extrinsic, intrinsic, and overuse factors are associated with rotator cuff pathology.
Role: PI

Past Intramural Funding:

1) University of Minnesota Dept. of Orthopaedic Surgery 4/2015-3/2018
Movement-related Pathogenesis of Rotator Cuff Disease in Persons with Shoulder Pain
Description: The specific aims of this study are to: 1) Determine the impact of decreased scapular upward rotation on rotator cuff compression in persons with shoulder pain; and 2) Identify the mechanisms by which sternoclavicular and acromioclavicular joint motion contribute to scapular upward rotation.

Role: Co-PI

2) NIH/University of Minnesota T32-AR050938 (Clohisy, Carlson) 4/2014-3/2016
Department of Orthopaedic Surgery Musculoskeletal Training Grant
Role: Trainee

Bibliography

§ indicates trainee or junior faculty mentored by Dr. Lawrence; *indicates co-first authors

Original, peer reviewed articles in refereed journals

1) **Lawrence RL**, Braman JP, LaPrade RF, Ludewig PM. Comparison of 3-dimensional shoulder complex kinematics in individuals with and without shoulder pain-Part I: Sternoclavicular, acromioclavicular, and scapulothoracic joints. Journal of Orthopaedic and Sports Physical Therapy. 2014. 44: 636-A8.
2) **Lawrence RL**, Braman JP, Staker JL, LaPrade RF, Ludewig PM. Comparison of 3-dimensional shoulder complex kinematics in individuals with and without shoulder pain-Part II: Glenohumeral joint. Journal of Orthopaedic and Sports Physical Therapy. 2014. 44: 646-B3.
3) Sessions WC, **Lawrence RL**, Steubs JT, Braman JP, Ludewig PM. Thickness of the rotator cuff tendons at the articular margin: An anatomic cadaveric study. Iowa Orthopaedic Journal. 2017. 37: 85-89.
4) **Lawrence RL**, Schlangen DM, Schneider K.A., Schoenecker J, Senger A.L, Starr WC, Staker JL, Ellermann JM, Braman JP, Ludewig PM. Effect of glenohumeral elevation during functional reach on rotator cuff mechanical impingement. Journal of Orthopaedic Research. 2017. 35: 2329-2337.
5) **Lawrence RL**, Ellingson AM, Ludewig PM. Validation of single-plane fluoroscopy and 2D/3D shape-matching for quantifying shoulder complex kinematics. Medical Engineering & Physics. 2018. 52: 69-75.
6) **Lawrence RL**, Sessions WC, Jensen M, Staker JL, Eid A, Breighner R, Helwig NE, Braman JP, Ludewig PM. The effect of glenohumeral plane of elevation on supraspinatus subacromial proximity. Journal of Biomechanics. 2018. 79: 147-154.
7) Akbari-Shandiz M, **Lawrence RL**, Johnson CP, Zhao KD, Ellingson AM, Ludewig PM. MRI vs CT-Based 3D-2D auto-registration accuracy for quantifying shoulder motion using biplane fluoroscopy. Journal of Biomechanics. 2019. 82: 375-380.
8) **Lawrence RL**, Braman JP, Ludewig PM. The impact of decreased scapulothoracic upward rotation on subacromial proximities. Journal of Orthopaedic and Sports Physical Therapy. 2019. 49: 180-191.
9) **Lawrence RL**, Braman JP, Keefe DF, Ludewig PM. The coupled kinematics of scapulothoracic upward rotation. Physical Therapy. 2020. 100: 283-294.
10) Kage CC, Akbari-Shandiz M, Foltz MH, **Lawrence RL**, Brandon TL, Helwig NE, Ellingson AM. Validation of an automated shape-matching algorithm for biplane radiographic spine osteokinematics and radiostereometric analysis error quantification. PLOS One. 2020. 15: e0228594.
11) **Lawrence RL**, Ruder MC, Zauel R, Bey MJ. Instantaneous helical axis estimation of glenohumeral kinematics: The impact of rotator cuff pathology. Journal of Biomechanics. 2020. 109: 109924.
12) **Lawrence RL**, Ruder MC, Moutzouros V, Makhni EC, Muh SJ, Siegal D, Soliman SC, van Holsbeeck M, Bey MJ. Ultrasound shear wave elastography and its association with

rotator cuff tear characteristics. Journal of Shoulder and Elbow Surgery International. 2021. 5: 500-506.

13) Saini G, **Lawrence RL**, Staker JL, Braman JP, Ludewig PM. Supraspinatus-to-glenoid contact occurs during standardized overhead reaching motion. Orthopaedic Journal of Sports Medicine. 2021. 9: 23259671211036908.
14) Ruder MC, **Lawrence RL**, Soliman SB, Zauel R, van Holsbeeck M, Bey MJ. Pre-surgical tear characteristics and estimated shear modulus as predictors of repair integrity and shoulder function one year after rotator cuff repair. Journal of Shoulder and Elbow Surgery International. 2021. 6: 62-69.
15) **Lawrence RL**, Zauel R, Bey MJ. Measuring 3D in-vivo shoulder kinematics using biplanar videoradiography. Journal of Visualized Experiments. 2021. 169: 10.3791/62210.
16) **Lawrence RL**, Ruder MC, Zauel R, Jalics A, Olszewski A, Diefenbach B, Moutzouros V, Makhni EC, Muh S, Bey MJ. In vivo static retraction and dynamic elongation of rotator cuff repair tissue after surgical repair: A preliminary analysis at 3 months. Orthopaedic Journal of Sports Medicine. 2022. 10: 23259671221084294.
17) Aliaj K, **Lawrence RL**, Foreman B, Chalmers P, Henninger H. Kinematic coupling of the glenohumeral and scapulothoracic joints generates humeral axial rotation. Journal of Biomechanics, 2022. 136: 111059.
18) **Lawrence RL**, *§*Roseni K, Bey MJ. Correspondence between scapular anatomical coordinate systems and the 3D axis of motion: a new perspective on an old challenge. Journal of Biomechanics, 2022. 145: 111385.
19) **Lawrence RL**, Soliman SB, *§*Roseni K, Zauel R, Bey MJ. In vivo evaluation of rotator cuff internal impingement during scapular plane abduction in asymptomatic individuals. Journal of Orthopaedic Research, 2023. 41: 718-726.
20) Braudy R, Atoms B, Coghlan J, Staples M, Moga D, Tollefsrud R, **Lawrence RL**, Ludewig PM, Koehler L. Shoulder Kinematics of Axillary Web Syndrome in Women Treated for Breast Cancer. Archives of Physical Medicine and Rehabilitation, 2023. 104: 403-409.
21) **Lawrence RL**, Veluswamy B, Dobben EA, Klochko C, Soliman SB. Predictors of infraspinatus muscle degeneration in individuals with an isolated supraspinatus tendon tear. Skeletal Radiology, 2023. 52: 695-703.
22) **Lawrence RL**, Saini G, Staker JL, Ludewig PM. Comparison of rotator cuff to glenoid proximity based on scapulothoracic upward rotation classification. Brazilian Journal of Physical Therapy, 2023. 27: 100505.
23) **Lawrence RL**, Soliman SB, Dalbøge A, Lohse K, Bey MJ. Investigating the multifactorial etiology of supraspinatus tendon tears. Journal of Orthopaedic Research, 2024. 42: 578-587.
24) **Lawrence RL**, Brown LB, Bilodeau HL, Bonath DJ, Dahn DJ, Em MA, Sarkar S, Braman JP, Ludewig PM. Effects of scapular angular deviations on potential for rotator cuff tendon mechanical compression. Orthopaedic Journal of Sports Medicine, 2024. 12: 23259671231219023.
25) Khandare S, **Lawrence RL**, Jalics A, Zauel R, Klocko C, Bey MJ. A novel 3D MRI-based approach for assessing supraspinatus muscle length. Journal of Biomechanics, 2024. 168: 112110.
26) *§*Lee ECS, **Lawrence RL**, Rainbow MJ. Sexual dimorphism and allometry in human scapula morphology. Journal of Anatomy, 2024. 245: 674-685.

27) **Lawrence RL**, Nicholson L, Lee ECS, Napier K, Zmistowski B, Rainbow MJ. Geometric accuracy of low dose CT scans for use in shoulder musculoskeletal research applications. Medical Engineering and Physics, 2024. 130: 104214.
28) **Lawrence RL**, Ivens R, Caldwell CA, Harris-Hayes M. The effect of scapular orientation on measures of rotator cuff tendon impingement: A simulation study. Journal of Applied Biomechanics, 2024. 40: 501-511.
29) Hoshikawa K, Dominguez M, **Lawrence RL**, Jacobs PM, Yuri T, Mura N, Giambini H. Muscle compensation strategies to maintain glenohumeral stability in rotator cuff tears: a cadaveric study. Journal of Bone and Joint Surgery, 2025. 107: 26-35.
30) §Chen S, Lee ECS, Napier KB, Rainbow MJ, **Lawrence RL**. The effect of low-dose CT protocols on shoulder model-based tracking using biplane videoradiography. Annals of Biomedical Engineering, 2025. 53: 481-491.
31) Lee ECS, Young NM, Li EY, **Lawrence RL**, Rainbow MJ. The stabilizing potential of the supraspinatus is inhibited in tear associated scapula shapes but can be modulated by kinematic adjustments. Frontiers in Bioengineering and Biotechnology, 2025. 13: 1505015.
32) Lee ECS, **Lawrence RL**, Young NM, Rainbow MJ. Scapular kinematics and task specificity: the effect of load direction. Journal of Biomechanics, 2025. 112932.
33) Khandare S*, **Lawrence RL***, Jalics A, Zauel R, Moutzouros V, Makhni EC, Muh S, Bey MJ. Longitudinal analysis of rotator cuff repair: Joint kinematics and clinical outcomes. Journal of Shoulder and Elbow Surgery International, 2025. 10(2):101421.
34) §Kahan LG, **Lawrence RL**, Keener JD, Aleem A, Zmistowski BM. Is Acromial Morphology Different in Patients with Eccentric Glenohumeral Osteoarthritis? Journal of Shoulder and Elbow Surgery, 2026. 35(3):740-748.

Reviews, Chapters, and Editorials, including Invited Publications

1) Ludewig PM, **Lawrence RL**, Braman JP. What's in a name? Using movement system diagnoses vs. pathoanatomical diagnoses. Journal of Orthopaedic and Sports Physical Therapy. 2013. 43: 280-283.
2) Braman JP, Zhao KD, **Lawrence RL**, Harrison AK, Ludewig PM. Shoulder impingement revisited: evolution of diagnostic understanding in orthopaedic surgery and physical therapy. Medical & Biological Engineering & Computing. 2014. 52: 211-219.
3) Ludewig PM, **Lawrence RL**. Mechanics of the Scapula in Shoulder Function and Dysfunction. In: Kibler WB, Sciascia AD, eds. Disorders of the Scapula and Their Role in Shoulder Injury-A Clinical Guide to Evaluation and Management. Springer, New York, NY; 2017.
4) Wilkes T, Ebaugh D, Spinelli B, **Lawrence RL**, Ludewig PM, Kibler WB. Anatomic and Physiologic Basis for Postoperative Rehabilitation for the Shoulder. In: Green A, Hayda R eds. Postoperative Orthopaedic Rehabilitation. American Academy of Orthopaedic Surgeons; 2017.
5) Ludewig PM, Kamonseki DH, Staker JL, **Lawrence RL**, Camargo PR, Braman JP. Changing our diagnostic paradigm: movement system diagnostic classification. International Journal of Sports Physical Therapy. 2017. 12: 884-893.
6) **Lawrence RL**, Moutzouros V, Bey MJ. Asymptomatic rotator cuff tears. JBJS Reviews. 2019. 7:e9.
7) **Lawrence RL**, Braman JP, Ludewig PM. Shoulder kinematics impact subacromial proximities: A review of the literature. Brazilian Journal of Physical Therapy. 2020. 24: 219-230.

8) **Lawrence RL**, Ludewig PM, Ward SR. An integrated approach to musculoskeletal performance, disease, and recovery. Physical Therapy. 2021. 101: pzab225.

Abstracts

Platform presentations

1) **Lawrence RL**, LaPrade RF, Braman JP, Ludewig PM. Differences in Shoulder Complex Motion in Subjects with and without Shoulder Pain. APTA Combined Sections Meeting. Las Vegas, NV. February 2014.
2) Bilodeau HL, Brown LB, Dahn DJ, Bonath DJ, Em M, Sarkar S, Braman JP, **Lawrence RL**, Ludewig PM. Effects of Scapular Position Changes on Rotator Cuff Tendon Mechanical Impingement Risk. 10th Conference of the International Shoulder Group; Waterloo, Ontario. July 2014.
3) **Lawrence RL**, Ludewig PM. Comparison between Methods of Calculating Shoulder Angular Displacements for Clinical Interpretation. 10th Conference of the International Shoulder Group; Waterloo, Ontario. July 2014.
4) **Lawrence RL**, Schlangen D, Schneider K, Schoenecker J, Senger A, Starr WC, Staker JL, Braman JP, Ludewig PM. The Interaction of Humeral Retroversion and Elevation on Supraspinatus Subacromial Compression during a Simulated Reaching Task. APTA Combined Sections Meeting; Anaheim, CA. February 2016.
5) Sessions WC, **Lawrence RL**, Staker JL, Ellermann JM, Braman JP, Ludewig PM. Minimal Distance Between the Supraspinatus Tendon and the Acromion During Multiplanar Humeral Elevation. Annual meeting of the Minnesota Orthopedic Society; Minneapolis, MN. May 2016.
6) **Lawrence RL**, Staker JL, Braman JP, Ludewig PM. Mechanical Internal Impingement of the Supraspinatus Tendon during a Simulated Reaching Task. 11th Conference of the International Shoulder Group; Winterthur, Switzerland. July 2016.
7) **Lawrence RL**, Schlangen D, Schneider K, Schoenecker J, Senger A, Starr WC, Staker JL, Braman JP, Ludewig PM. The Effect of Humeral Elevation and Retroversion on Supraspinatus Subacromial Compression during a Simulated Reaching Task. 11th Conference of the International Shoulder Group; Winterthur, Switzerland. July 2016. **Won PhD Student Award.*
8) **Lawrence RL**, Staker JL, Braman JP, Ludewig PM. Mechanical Internal Impingement of the Supraspinatus Tendon during Simulated Reaching. APTA Combined Sections Meeting; San Antonio, TX. February 2017.
9) Staker JL, **Lawrence RL**, Braman JP, Ludewig PM. Effects of Shoulder Elevation Plane on Rotator Cuff Subacromial Proximity. APTA Combined Sections Meeting; San Antonio, TX. February 2017.
10) Akbari-Shandiz M, **Lawrence RL**, Ellingson AM, Zhao KD, Ludewig PM. MRI vs CT-Based Shape Registration Accuracy for Quantifying Shoulder Motion Using Biplane Fluoroscopy. Annual Meeting of the American Society of Biomechanics; Boulder, CO. August 2017.
11) **Lawrence RL**, Ludewig PM. The Relationship between Glenohumeral Kinematics and Subacromial Proximities. APTA Combined Sections Meeting; New Orleans, LA. February 2018.
12) **Lawrence RL**, Ludewig PM. The Effect of Scapulothoracic Upward Rotation on Subacromial Proximities. Annual Meeting of the American Society of Biomechanics; Rochester, MN. August 2018. **Won PhD Student Award.*

13) Looft JM, Eid M, Fischbach J, Spracklin A, **Lawrence RL**, Ellingson AM, Braman JP, Ludewig PM. Finite Element Model of the Supraspinatus Tendon During Simulated Functional Reach. 12th Conference of the International Shoulder Group; Rochester, MN, USA. August 2018.
14) **Lawrence RL**, Ludewig PM. The Coupled Mechanics of Scapulothoracic Upward Rotation. 12th Conference of the International Shoulder Group; Rochester, MN, USA. August 2018.
15) Staker JL, **Lawrence RL**, Braman JP, Ludewig PM. Kinematics and Utility of Shoulder Joint Laxity Tests as Diagnostic Criteria in Multidirectional Instability. 12th Conference of the International Shoulder Group; Rochester, MN, USA. August 2018.
16) Kage CC, Shandiz-Akbari M, Foltz MH, **Lawrence RL**, Brandon T, Twohey E, Ellingson AM. Lumbar Spine Biplane Fluoroscopy Validation via an Automated Shape-Matching Algorithm. Annual Meeting of the American Society of Biomechanics; Rochester, MN. August 2018.
17) **Lawrence RL**, Keefe DF, Braman JP, Ludewig PM. Kinematic Mechanisms of Scapulothoracic Upward Rotation. APTA Combined Sections Meeting; Washington, DC. January 2019.
18) Ludewig PM, Looft J, Spracklin A, Staker JL, **Lawrence RL**, Braman JP. Supraspinatus Stress and Strain across Arm Elevation. APTA Combined Sections Meeting; Washington, DC. January 2019.
19) **Lawrence RL**, Baumer TG, Ruder M, Zauel R, Mourzouros V, Bey MJ. The Relationship between 3D Glenohumeral Morphology and Rotator Cuff Pathology. Annual meeting of the Orthopaedic Research Society; Austin, TX. February 2019.
20) Ellingson AM, Kage CC, Foltz MH, Johnson CP, **Lawrence RL**, Ludewig PM. Imaging Approaches to Quantifying Spinal Pathomechanics. XXVII Congress of the International Society of Biomechanics; Calgary, Canada. August 2019.
21) **Lawrence RL**, Ruder MC, Bojnowski J, Moutzouros V, Bey MJ. Supraspinatus Shear Wave Speed as a Predictor of Tear Chronicity and Pre-Operative Shoulder Function. APTA Combined Sections Meeting; Denver, CO. February 2020.
22) Ruder MC, **Lawrence RL**, Bey MJ. Running Exposure is Associated with Achilles Tendon Shear Wave Speed. Annual Meeting of the American Society of Biomechanics; virtual. August 2020.
23) **Lawrence RL**, Ruder MC, Diefenbach BJ, Moutzouros V, Makhni EC, Muh S, Bey MJ. Rotator Cuff Repair Tissue Elongation Measured in-vivo 3 Months Following Arthroscopic Repair. APTA Combined Sections Meeting; San Antonio, TX. February 2022.
24) Ivens R**,** Harris-Hayes M, **Lawrence RL**. The impact of altering scapular kinematics on the proximity between the rotator cuff footprint and the glenoid. Annual meeting of the American Society of Shoulder and Elbow Therapists; Atlanta, GA. October 2022.
25) **Lawrence RL**, Ivens R, Harris-Hayes M. The effect of Scapular Kinematics on Mechanisms of Rotator Cuff Injury: Subacromial Impingement. APTA Combined Sections Meeting; San Diego, CA. February 2023.
26) **Lawrence RL**, Ivens R, Harris-Hayes M. The effect of Scapular Kinematics on Mechanisms of Rotator Cuff Injury: Internal Impingement. APTA Combined Sections Meeting; San Diego, CA. February 2023.
27) *§*Lee ECS, **Lawrence RL**, Rainbow M. Disentangling Allometry and Sex-Based Differences in Scapula Shape. Annual Meeting of the International Society of Biomechanics; Fukuoka, Japan. August 2023.

28) **Lawrence RL,** Dobben EA, Klochko CL, Soliman SB. The Not-So-Inferior Infraspinatus Muscle: Predictors of Infraspinatus Muscle Degeneration with an Isolated Supraspinatus Tendon Tear. Annual meeting of the Radiological Society of North America (RSNA); Chicago, IL. November 2023.
29) **Lawrence RL**, Soliman SB, Dalbøge A, Lohse KR, Bey MJ. Morphology and Occupational Exposure as Predictors of Supraspinatus Tendon Tears. APTA Combined Sections Meeting; Boston, MA. February 2024.
30) *§*Lee ECS, Young NM, Li EY, **Lawrence RL**, Rainbow MJ. Tear-Associated Scapular Morphology Alters the Stabilizing Role of Supraspinatus. 14th Conference of the International Shoulder Group; Toronto, ON. June 2024. **Won PhD Student Award.*
31) *§*Chen S, *§*Lee ECS, Rainbow MJ, **Lawrence RL**. Geometric and Kinematic Accuracy of Low Dose CT Protocols for Shoulder Analysis. 14th Conference of the International Shoulder Group; Toronto, ON. June 2024.
32) **Lawrence RL**, *§*Kahan L, Keener JD, Zmistowski B. Scapular Morphology in Glenohumeral Arthritis: Phenotypes and Implications for Physical Therapists. APTA Combined Sections Meeting; Houston, TX. February 2025.
33) *§*Chen S, *§*Dechiro B, *§*Nicholson L, *§*Seifried N, **Lawrence R**L. Measurement of Glenohumeral Joint Arthrokinematics in Asymptomatic Individuals with an Intact Supraspinatus Tendon. APTA Combined Sections Meeting; Houston, TX. February 2025.
34) Froehlich L, **Lawrence RL**, Swick CHK, Harris MD, Harris-Hayes M. Movement Training versus Strengthening on an Untrained Task Among People with Chronic Hip-Related Groin Pain. APTA Combined Sections Meeting; Houston, TX. February 2025.
35) Hoshikawa K, Dominguez M, **Lawrence R**L, Jacobs P, Yuri T, Mura N, Giambini H. Muscle Compensation Strategies to Maintain Glenohumeral Joint Stability with Rotator Cuff Tears. Annual meeting of the Orthopaedic Research Society; Phoenix, AZ. February 2024.
36) **Lawrence RL**, *§*Kahan L, Keener JD, Zmistowski B. The relationship between 3D scapular morphology and glenohumeral osteoarthritis. Annual Meeting of the American Society of Biomechanics; Pittsburgh, PA. August 2025.
37) Zmistowski B, *§*Kahan L, Keener JD, **Lawrence RL**. The Relationship Between Acromial Morphology and Eccentric Glenohumeral Osteoarthritis: A Three-Dimensional Analysis. Annual Congress of the European Society for Surgery of the Shoulder and Elbow; Rotterdam, The Netherlands. September 2025.
38) Ivens R, **Lawrence RL**. Comparison of Simulated Clinical Measures of Scapulothoracic Upward Rotation to 3D Laboratory-Based Measures. Annual Meeting of the American Society of Shoulder and Elbow Therapists. San Diego, CA. October 2025.
39) *§*Chen S, Harris-Hayes M, Harris MD, **Lawrence RL**. Glenohumeral Joint Proximity Pattern Variables to Centroid Calculation Method. 15th Conference of the International Shoulder Group; Lyon, France. June 2026.
40) Hellem A, Men Lu, Saini G, Staker JL, **Lawrence RL**, Ellingson AM, Ludewig PM, Rezvanifar C. Characterization of Scapular Shape Variation and its Geometric Drivers in Symptomatic and Asymptomatic Cohorts. 15th Conference of the International Shoulder Group; Lyon, France. June 2026.

<u>Poster presentations</u>

1) Schlichte BM, Farrell KP, Jones CL, **Lawrence RL**. Neurological Symptoms Status Post Arthroscopic Tenotomy of the Long Heads of the Biceps. APTA Combined Sections Meeting; San Diego, SD. January 2013.

2) Budlong MR, Butala BE, Clark RM, Dragseth JR, Ebert TR, Foelker RJ, **Lawrence RL**, Staker JL, Ludewig PM. Effects of Feedback Types on Sternoclavicular Elevation and Upper Trapezius Activation in Persons with Shoulder Pain. Spring Conference, Minnesota Chapter of the APTA; St. Paul, MN. April 2014.
3) **Lawrence RL**, LaPrade RF, Braman JP, Ludewig PM. Shoulder Complex Coupling as a Mechanism for Kinematic Differences between Symptomatic and Asymptomatic Subjects. 10th Conference of the International Shoulder Group; Waterloo, Ontario. July 2014.
4) Dragseth J, Budlong M, Butala B, Clark R, Ebert T, Foelker R, **Lawrence RL**, Staker JL, Ludewig PM. Effects of Feedback Types on Sternoclavicular Elevation and Upper Trapezius Activation in Persons with Shoulder Pain. APTA Combined Sections Meeting; Indianapolis, IN. February 2015.
5) Staker JL, **Lawrence RL**, Ludewig PM. Movement-Based Biomechanical Examination Following a Three-Year Case of Scapular Dyskinesia. APTA Combined Sections Meeting; Indianapolis, IN. February 2015.
6) Sessions WC, **Lawrence RL**, Staker JL, Ellermann JM, Braman JP, Ludewig PM. Minimal Distance Between the Supraspinatus Tendon and the Acromion During Multiplanar Humeral Elevation. Minnesota Medical Association's Annual Conference; Minneapolis, MN. September 2015.
7) **Lawrence RL**, Schlangen D, Schneider K, Schoenecker J, Senger A, Starr WC, Staker JL, Ellermann JM, Braman JP, Ludewig PM. Effects of Humeral Elevation on Supraspinatus Mechanical Impingement During a Simulated Reaching Task. University of Minnesota Institute of Engineering in Medicine Annual Conference; Minneapolis, MN. September 2015.
8) Schlangen D, Schneider K, Schoenecker J, Senger A, Starr WC, **Lawrence RL**, Staker JL, Braman JP, Ludewig PM. Effects of Humeral Elevation on Supraspinatus Mechanical Impingement during a Simulated Reaching Task. APTA Combined Sections Meeting; Anaheim, CA. February 2016.
9) **Lawrence RL**, Schlangen D, Schneider K, Schoenecker J, Senger A, Starr WC, Staker JL, Ellermann JM, Braman JP, Ludewig PM. Effects of Humeral Elevation on Supraspinatus Mechanical Impingement during a Simulated Reaching Task. Annual meeting of the Orthopaedic Research Society; Orlando, FL. March 2016.
10) Long M, **Lawrence RL**, Braman JP, Ludewig PM. Spatial Interactions Between the Supraspinatus Tendon and Coracoacromial Arch Through Three Planes and a Range of Glenohumeral Elevations. John S. Rogers Science Program, Lewis and Clark University; Portland, OR. August 2016.
11) Braman JP, **Lawrence RL**, Staker JL, Ludewig PM. Is Impingement Dead? Concern for the Extrinsic Mechanism. Annual meeting of the American Shoulder and Elbow Surgeons (ASES); Boston, MA. October 2016.
12) **Lawrence RL**, Ellingson AM, Ludewig PM. Single Plane Fluoroscopy for Quantifying Shoulder Complex Kinematics and Subacromial Proximities. Annual meeting of the Orthopaedic Research Society; San Diego, CA. March 2017.
13) Kim K, **Lawrence RL**, Kyllonen N, Ludewig PM, Ellingson AM, Keefe DF. Anatomical 2D/3D Shape-Matching in Virtual Reality: A User Interface for Quantifying Joint Kinematics with Radiographic Imaging. IEEE Symposium on 3D User Interfaces (3DUI); Los Angeles, CA. March 2017.
14) Spracklin A, **Lawrence RL**, Ludewig PM. The Effect of Axial Rotation on Shoulder Impingement. University of Minnesota Undergraduate Research Symposium; Minneapolis, MN. April 2017.

15) Boudlali H, Akbari-Shandiz M, Kage C, Foltz M, **Lawrence RL**, Ellingson AM. Comparative Accuracy of Models Derived from CT Versus MRI for Measuring Intersegmental Cervical Spine Motion Using Biplanar Fluoroscopy. University of Minnesota Undergraduate Research Symposium; Minneapolis, MN. April 2017.
16) Kage C, Akbari-Shandiz M, **Lawrence RL**, Boudlali H, Foltz M, Ellingson AM. Validation of Biplane Fluoroscopy for Cervical Spine Kinematics. Annual Meeting of the American Society of Biomechanics; Boulder, CO. August 2017.
17) Looft JM, Eid M, Fischburn J, **Lawrence RL**, Ellingson AM, Ludewig PM. Stress and Strain in the Supraspinatus Tendon during a Simulated Functional Reach. Annual meeting of the Orthopaedic Research Society; New Orleans, LA. March 2018.
18) Akbari-Shandiz M, **Lawrence RL**, Ellingson AM, Zhao KD, Ludewig PM. Validation of an Automatic 3D-2D Registration Algorithm for Quantifying Shoulder Motion Using MRI/CT Image Volume and Biplane Fluoroscopy. Annual meeting of the Orthopaedic Research Society; New Orleans, LA. March 2018.
19) **Lawrence RL**, Sessions WC, Jensen M, Staker JL, Eid A, Breighner R, Helwig NE, Braman JP, Ludewig PM. The Effect of Glenohumeral Plane of Elevation on Supraspinatus Subacromial Proximity. University of Minnesota Supercomputing Institute Research Exhibition; Minneapolis, MN. April 2018.
20) Kage C, Akbari-Shandiz M, **Lawrence RL**, Foltz M, Brandon T, Twohey E, Ellingson AM. Biplane Fluoroscopic Kinematic Comparison of an Automated Shape-Matching Technique vs. RSA for Cervical Spine Flexion Motion. World Congress of Biomechanics; Dublin, Ireland. July 2018.
21) Staker JL, **Lawrence RL**, Ellingson AM, Haglund SN, Braman JP, Ludewig PM. Comparison of Dynamic Joint Kinematics During Shoulder Elevation in Healthy Controls and Individuals Diagnosed with Multidirectional Instability. Annual Meeting of the American Society of Biomechanics; Rochester, MN. August 2018.
22) Kage C, Akbari-Shandiz M, Foltz MH, **Lawrence RL**, Brandon T, Twohey E, Ellingson AM. Cervical Spine Biplane Fluoroscopy: Automated Shape-Matching Algorithm Validation. Annual Meeting of the American Society of Biomechanics; Rochester, MN. August 2018.
23) Staker JL, **Lawrence RL**, Ellingson AM, Haglund S, Braman JP, Ludewig PM. Comparison of Dynamic Joint Kinematics during Shoulder Elevation in Healthy Controls and Individuals Diagnosed with Multidirectional Instability. APTA Combined Sections Meeting; Washington, DC. January 2019.
24) **Lawrence RL**, Braman JP, Ludewig PM. The Effect of Decreased Scapulothoracic Upward Rotation on Subacromial Proximities. APTA Combined Sections Meeting; Washington, DC. January 2019.
25) Saini G, Spracklin AL, **Lawrence RL**, Ludewig PM. The Effect of Axial Rotation on Shoulder Subacromial Contact and Compression. APTA Combined Sections Meeting; Washington, DC. January 2019.
26) Ruder MC, **Lawrence RL**, Baumer TG, Zauel R, Bey MJ. The Effect of Region of Interest Definition and Data Fidelity on Mean Shear Wave Speed. Annual meeting of the Orthopaedic Research Society; Austin, TX. February 2019.
27) Ruder MC, **Lawrence RL**, Baumer TG, Zauel R, Bey MJ. The Effect of Region of Interest Definition and Data Fidelity on Mean Shear Wave Speed. Henry Ford Health System Research Symposium; Detroit, MI. May 2019.
28) Ruder MC, **Lawrence RL**, Zauel R, Bey MJ. Preliminary Comparison of Activity Levels between Rotator Cuff Repair Patients and Control Subjects. Annual Meeting of the American Society of Biomechanics; virtual. August 2020.

29) **Lawrence RL**, Ruder MC, Zauel R, Jalics A, Olszewski A, Tchernychouk V, Moutzouros V, Makhni EC, Muh SJ, Bey MJ. Rotator Cuff Repair Tissue Elongation at 3 Months Following Arthroscopic Repair. Annual meeting of the Orthopaedic Research Society; virtual. February 2021.
30) **Lawrence RL**, Staker JL, Farrell KP, Soliman SB. Diagnostic Accuracy of Clinical Special Tests for Detecting Asymptomatic Rotator Cuff Tears. APTA Combined Sections Meeting; San Antonio, TX. February 2022.
31) **Lawrence RL**, *§*Nicholson L, *§*Lee ECS, Napier K, Zmistowski B, Rainbow MJ. Geometric Accuracy of Low Dose CT Scans for Shoulder Musculoskeletal Modeling. Annual meeting of the Orthopaedic Research Society; Long Beach, CA. February 2024.
32) *§*Nicholson L, *§* Lee ECS, Napier K, Zmistowski B, Rainbow MJ, **Lawrence RL**. Geometric Accuracy of Low Dose CT Protocols for Musculoskeletal Shoulder Modeling. Washington University Undergraduate Research Symposium; St. Louis, MO. April 2024.
33) *§*Baldwin S, **Lawrence RL**. Developing Procedures for Reconstructing Fast and Accurate 3D Anatomical Models from CT. Washington University Undergraduate Research Symposium; St. Louis, MO. April 2024.
34) *§*Chen S, *§*Lee ECS, Rainbow MJ, **Lawrence RL**. Accuracy of low dose CT scanning for shoulder morphology and motion analysis. Annual meeting of the American Society of Biomechanics; Madison, WI. August 2024.
35) **Lawrence RL**, Ambler SB, Harris-Hayes M. Computer Simulation for Teaching and Learning Basic Mechanical Concepts Relevant to Biomedical Applications. APTA Combined Sections Meeting; Houston, TX. February 2025.
36) *§*Dechiro C, *§*Seifried N, *§*Chen S, *§*Nicholson L, **Lawrence RL**. Glenohumeral joint arthrokinematics as a biomarker for shoulder symptoms and pathology. Washington University Undergraduate Research Symposium; St. Louis, MO. April 2025.
37) *§*Seifried N, *§*Chen S, *§*Dechiro C, *§*Nicholson L, **Lawrence RL**. Measurement of Glenohumeral Joint Arthrokinematics in Asymptomatic Individuals with an Intact Supraspinatus Tendon. University of Notre Dame College of Science Joint Annual Meeting; South Bend, IN. May 2025.
38) *§*Nicholson L, *§*Lee ECS, Rainbow MJ, Zmistowski B, **Lawrence RL**. Evaluation of Clavicle Morphology using Statistical Shape Modeling. Annual Meeting of the American Society of Biomechanics; Pittsburgh, PA. August 2025.
39) *§*Chen S, Harris-Hayes M, Harris MD, **Lawrence RL**. The Sensitivity of Glenohumeral Joint Arthrokinematic Variables to Different Calculation Methods. Annual Meeting of the American Society of Biomechanics; Pittsburgh, PA. August 2025.
40) **Lawrence RL**, Keener JD, Zmistowski BM. Glenohumeral kinematics throughout scapular plane abduction are associated with scapular morphology. Annual Meeting of the Orthopaedic Research Society; Charlotte, NC. March 2026.
41) *§*Baldwin S, *§*Chen S, **Lawrence RL**. Analyzing Key Anatomical and Functional Difference of Shoulder Movement and Pain Patterns across Sex. Washington University Undergraduate Research Symposium; St. Louis, MO. April 2026.
42) *§*Spracklin A, *§*Nicholson LM, Lee ECS, Rainbow MJ, **Lawrence RL**. Clavicle Shape Variability May Influence Scapulothoracic Kinematics. 15th Conference of the International Shoulder Group; Lyon, France. June 2026. **Won Best Poster Award.*
43) Lee ECS, Bicknell R, Gui R, **Lawrence RL**, Rainbow MJ. A Morphable Shoulder Model for Investigating Patient-Specific Rotator Cuff Function. 16th International Congress on Shoulder and Elbow Surgery; Vancouver, Canada. September 2026 (accepted).

44) Kahan L, **Lawrence RL**, §Dechiro C, Namdari S, Fiandeiro M, Amini, Aleem A, Wright M, Keener JD, Zmistowski BM. Acromial Morphology is Associated with Stress Fracture Location Not Occurrence Following Reverse Total Shoulder Arthroplasty. 16th International Congress on Shoulder and Elbow Surgery; Vancouver, Canada. September 2026 (accepted).