Stanford



Matthew Smuck, MD

Professor of Orthopaedic Surgery

CLINICAL OFFICE (PRIMARY)

- **Stanford Orthopaedic Spine Center in Redwood City**
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ACADEMIC CONTACT INFORMATION

- **Alternate Contact**
  Katrina Souza - Administrative Associate
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Bio

BIO

Dr. Matthew Smuck, MD, is the Chief of PM&R, Professor and Vice-Chair of Orthopaedic Surgery at Stanford University where he specializes in the comprehensive conservative management of spine disorders. He is internationally recognized as a physician leader in rehabilitation and spine disorders resulting from his authorship of more than 100 publications, his contributions to spine care guidelines, and his leadership within professional medical societies and leading journals in the field. He served as President of the International Pain and Spine Intervention Society (IPSIS), Deputy Editor-in-Chief for the journal Interventional Pain Medicine, and Deputy Editor of The Spine Journal. He also served on the Board of Directors of the North American Spine Society (NASS), IPSIS, and the Foundation for PM&R. His research is focused on improving the safety and effectiveness of spine interventions, and on the use of mobile technology to improve musculoskeletal and neurologic disease detection, treatment and prevention. His work is recognized by numerous national and international awards including: the ISSLS Medtronic Award, the American Academy of PM&R's President's Citation Award, the PM&R Journal's Best Original Research Award, the ISSLS Prize, numerous Outstanding Paper Awards from The Spine Journal, the AAPM&R PASSOR Legacy Award, the NASS Henry Farfan Award, and the IPSIS Aprill Lifetime Achievement Award.

CLINICAL FOCUS

- Spine
- Physical Medicine & Rehabilitation
- Pain Medicine

ACADEMIC APPOINTMENTS

- Professor-Univ Med Line, Orthopaedic Surgery
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Director, University of Michigan PM&R Interventional Spine Fellowship, (2007-2008)
- Interim Director, The University of Michigan Spine Program, (2008-2008)
- Director, Stanford PM&R Spine Fellowship, (2009-2014)
- Chief, Physical Medicine & Rehabilitation, Stanford University, (2011- present)
- Medical Director of Rehabilitation Services, Stanford University Hospital & Clinics, (2011- present)
- Director and Founder, Wearable Health Lab, (2014- present)
- Vice Chair of Rehabilitation Services, Department of Orthopaedic Surgery, (2023- present)
- Department Wellbeing Director, Department of Orthopaedic Surgery, (2024- present)

HONORS AND AWARDS

- Charles Aprill Lifetime Achievement Award, International Pain and Spine Interventions Society (IPSIS) (2024)
- PASSOR Legacy Award, AAPM&R (2022)
- Henry Farfan Award, NASS (2021)
- Outstanding Paper Award: Basic Science, The Spine Journal (2018)
- Outstanding Paper Award: Surgical Science, The Spine Journal (2017)
- Runner-up: Outstanding Paper Award: Medical and Interventional Science, The Spine Journal (2017)
- The ISSLS Prize for Lumbar Spine Research, ISSLS (2016)
- Runner-up: Outstanding Paper Award: Medical and Interventional Science, The Spine Journal (2016)
- Best Original Research Award, Foundation for Physical Medicine and Rehabilitation and the PM&R Journal (2015)
- President's Citation Award, AAPM&R (2014)
- Best Pain and Spine Abstracts, American Academy of Physical Medicine & Rehabilitation (2014, 2013)
- Best Papers, North American Spine Society (NASS) Annual Meeting (2013, 2009)
- Instructor, International Pain and Spine Intervention Society (IPSIS) (2013)
- Outstanding Paper Award: Medical and Interventional Science, The Spine Journal (2013)
- Best Clinical Research Award, International Pain and Spine Intervention Society (IPSIS) (2014, 2013, 2012)
- Medtronic Best Poster Award, International Society for the Study of the Lumbar Spine (2012)
- Best Basic Science Research Award, International Pain and Spine Intervention Society (IPSIS) (2011)
- Best Musculoskeletal Research Award, American Academy of Physical Medicine & Rehabilitation (2011)
- Jose C. Montero MD Teaching Award, Stanford University, PM&R residency program (2010)
- Faculty Mentor, 1st Place Theodore M. Cole Resident Research Award, University of Michigan (2009, 2007, 2004)
- Young Investigator Award, US Bone and Joint Decade (2006)
- Most Outstanding Biomedical Research Paper, Indiana University School of Medicine (1997)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Associate Editor, Interventional Pain Medicine (2025 - present)
- Representative, Pain Medicine Coalition (2024 - present)
- Co-Chair, Payor Policy Review Committee (NASS) (2022 - present)
- Deputy Editor-in-Chief, Interventional Pain Medicine (2021 - 2025)
- President, International Pain and Spine Intervention Society (IPSIS) (2019 - 2021)

- Board of Directors, Foundation for PM&R (2016 - 2018)
- Board of Directors, North American Spine Society (NASS) (2015 - 2018)
- North American Representative, ICHOM Low Back Pain Steering Group (2014 - 2018)
- Board of Directors, IPSIS (2013 - 2023)
- Co-Chair, NASS 2013 and 2021 annual meetings (2013 - 2021)
- Chair, Research Division, (IPSIS) (2013 - 2015)
- Deputy Editor, The Spine Journal (2011 - 2017)
- Assistant Editorial Board, European Spine Journal (2011 - 2016)
- Chair, NASS Advanced Lumbar Spinal Injections Course (2011 - 2015)
- Co-Editor, Orthopedics Knowledge Update (OKU) Spine, 4th edition (2011 - 2012)
- Vice Chair, Spine and Pain Track, AAPM&R Program Planning Committee (2010 - 2014)
- Section Editor, Spine & Sports, SpineLine (2008 - 2013)

PROFESSIONAL EDUCATION

- Board Certification: Pain Medicine, American Board of Physical Medicine and Rehabilitation (2003)
- Board Certification: Physical Medicine and Rehab, American Board of Physical Medicine and Rehabilitation (2002)
- Fellowship: Stanford University Hospital - Interventional Spine (2002) CA
- Residency: Stanford University School of Medicine (2001) CA
- Internship: Oakwood Healthcare System (1998) MI
- Medical Education: Indiana University School of Medicine (1997) IN
- M.D., Indiana University , School of Medicine (1997)
- B.S., Milligan College , Biology, Humanities, French (1993)

LINKS

- Wearable Health Lab: http://pmr.stanford.edu/research/cmmt.html
- Public lecture on "Non Invasive Treatment of Back Pain" to the Stanford community: http://www.youtube.com/watch?v=BEQlPv79EU0
- The Spine Journal's 2013 Outstanding Paper Awards presentation: https://www.youtube.com/watch?v=z_uDicD42ro#t=565
- On Mobile Technology in Medical Research: http://www.healio.com/spine-surgery/basic-science/news/online/%7B2ebf18f6-9ae2-4b0e-ae94-be4cea026abb%7D/video-smuck-on-barriers-in-spine-research
- mHealth Connect conference presentations: https://www.youtube.com/watch?v=6eXwqqGz204&feature=youtu.be
- Spine Foundation Research Summit - Occupational Factors: https://elearning.spine.org/Mediasite7/Play/ce30b41bd45f47ada8e764f17e97eee31d?catalog=23a72182-c7c7-478f-925b-4a86d96932e1
- ICHOM outcomes recommendations for low back pain: http://www.ichom.org/project/low-back-pain/
- Get a Second Opinion: https://stanfordhealthcare.org/second-opinion/overview.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

I direct the Wearable Health Lab at Stanford, investigating medical applications of mobile technology to improve musculoskeletal and neurologic disease detection, treatment and prevention.

CLINICAL TRIALS

- Cutaneous Administration of Local Anesthetic for Spine Injection Procedures, Not Recruiting

- INTRACEPT: Prospective, Randomized, Multi-center Study Intraosseous Basivertebral Nerve Ablation for Treatment of CLBP, Not Recruiting
- Lumbar Transforaminal Epidural Corticosteroid Injection(s) Versus Defined Physical Therapy, Not Recruiting
- Prescribed Physical Activity in Improving Sleep and Physical Performance in Patients Undergoing Stem Cell Transplant, Not Recruiting

Publications

PUBLICATIONS

- **Sit-to-Stand Performance, Moderate-to-Vigorous Physical Activity, and Health-Related Quality of Life in Knee Osteoarthritis: A Prospective Mediation Analysis.** *Preventing chronic disease*
  Dean, K., Nemati, D., Sun, R., Smuck, M., Kushioka, J., Best, T. M., Kaushal, N.
  2026; 23: E09
- **Early outcomes from intra-articular lateral C1-2 joint steroid injections: A retrospective case series.** *Interventional pain medicine*
  Kaufman, M. W., Yeung, G., Rittenberg, J., Huynh, L., Smuck, M., Levin, J.
  2026; 5 (1): 100737
- **Temporal Patterns of Wearable Accelerometer-Measured Physical Activity and Symptom Worsening in Knee Osteoarthritis: A 2-Year Longitudinal Study from the Osteoarthritis Initiative.** *Sensors (Basel, Switzerland)*
  Kushioka, J., Sun, R., Smuck, M.
  2026; 26 (3)
- **Objective physical performance and exercise tests of patients with lumbar spinal stenosis: a systematic scoping review.** *BMC sports science, medicine & rehabilitation*
  Kordi, R., Oskouie, I. M., Nakhjiri, M. T., Smuck, M.
  2026
- **Re-evaluation of categorial outcomes using common clinically relevant improvement thresholds following bilateral L2 medial branch restorative neurostimulation verses sham.** *The spine journal : official journal of the North American Spine Society*
  Smuck, M., Lukes, D., Schneider, B., Kennedy, D. J., Chen, A. S., McCormick, Z. L.
  2025
- **Feasibility of a mobile application to track longitudinal pain outcomes after epidural joint injections.** *Interventional pain medicine*
  Zheng, P. Z., Miclau, T., Goenawan, B., Johnson, G., O'Neill, C., Tamura, L., Wu, P. I., Smuck, M.
  2025; 4 (4): 100709
- **Intra-articular cervical facet joint corticosteroid injections in patients with increased peri-facet MRI STIR signal. A prospective, multi-center case series.** *Interventional pain medicine*
  Levin, J., Barrette, K., Ghaffari, C., Ehsanian, R., Koltsov, J., Giacomazzi, C., Prabhakar, N., Huynh, L., Smuck, M., Summers, W., Schneider, B.
  2025; 4 (4): 100646
- **Sit-to-stand Performance As A Proxy For K-l Grade Scores In Knee Osteoarthritis-Serial Mediation Analysis**
  Nemati, D., Sun, R., Kushioka, J., Smuck, M., Best, T. M., Kaushal, N.
  LIPPINCOTT WILLIAMS & WILKINS.2025: 727-728
- **Exploring Activity Patterns In Chronic Low Back Pain Patients Using Accelerometry-based Step Count Data**
  Sun, R., Bailey, J., Lotz, J., Smuck, M.
  LIPPINCOTT WILLIAMS & WILKINS.2025: 686
- **"Is this injection going to hurt?" Quantifying the pain experience during common lumbosacral spine injections.** *Interventional pain medicine*
  Smuek, A., Bakshi, R., Mays, R., Huynh, L., Levin, J., Rittenberg, J., Smuck, M.
  2025; 4 (3): 100632
- **Normative Data for Timed-Up-and-Go and One-Leg-Standing for 66-Year-Old Koreans: A Nationwide Study.** *Journal of the American Medical Directors Association*
  Chung, J., Smuck, M., Sun, R., Byun, S.
  2025: 105773
- **Comparing Physical Activity Outcomes From Simultaneously Worn Wrist and Hip Accelerometers in Adults With Chronic Low Back Pain: Quantifying Bias and Improving Data Harmonization** *JOURNAL FOR THE MEASUREMENT OF PHYSICAL BEHAVIOUR*

Sun, R., Safundzic, M., Bailey, J., Lotz, J., Smuck, M., REACH Invest
2025; 8 (1)

- **Incidence and risk factors for complications following cervical epidural steroid injections.** *The spine journal : official journal of the North American Spine Society*
  Wadhwa, H., Rohde, M., Koltsov, J. C., Cabell, A., Smuck, M., Hu, S. S., Kleimeyer, J. P.
  2024
- **A cost-effectiveness analysis of intraosseous basivertebral nerve ablation for the treatment of chronic low back pain.** *The spine journal : official journal of the North American Spine Society*
  Smuck, M., McCormick, Z. L., Gilligan, C., Hailey, M. K., Quinn, M. L., Bentley, A., Metcalfe, K., Bradbury, B., Lukes, D. J., Taylor, R. S.
  2024
- **Insole Pressure Sensors to Assess Post-Stroke Gait.** *Annals of rehabilitation medicine*
  Nam, H. S., Clancy, C., Smuck, M., Lansberg, M. G.
  2024
- **Low Back Pain-related Healthcare Utilization following Intraosseous Basivertebral Nerve Radiofrequency Ablation: A Pooled Analysis from Three Prospective Clinical Trials.** *Pain medicine (Malden, Mass.)*
  McCormick, Z. L., Curtis, T., Cooper, A., Wheatley, M., Smuck, M.
  2023
- **Intraosseous basivertebral nerve ablation: Pooled long-term outcomes from two prospective clinical trials.** *Interventional pain medicine*
  Smuck, M., Truumees, E., Macadaeg, K., Jaini, A. M., Chatterjee, S., Levin, J.
  2023; 2 (2): 100256
- **LONGITUDINAL ANALYSIS BETWEEN THE PROGRESSION OF KNEE OSTEOARTHRITIS AND PHYSICAL ACTIVITY: DATA FROM THE OSTEOARTHRITIS INITIATIVE**
  Kushioka, J., Sun, R., Smuck, M.
  ELSEVIER SCI LTD.2023: S159
- **Self-reported physical function is strongly related to pain behavior and pain interference and weakly related to physical capacity in people with chronic low back pain.** *Musculoskeletal science & practice*
  Karayannis, N. V., Smuck, M., Law, C., Mackey, S. C., Gross, J. J., Darnall, B. D., Hush, J.
  2023: 102721
- **A Comparison of Wrist- Versus Hip-Worn ActiGraph Sensors for Assessing Physical Activity in Adults: A Systematic Review** *JOURNAL FOR THE MEASUREMENT OF PHYSICAL BEHAVIOUR*
  Gall, N., Sun, R., Smuck, M.
  2022; 5 (4): 252-262
- **Gait Variability to Phenotype Common Orthopedic Gait Impairments Using Wearable Sensors.** *Sensors (Basel, Switzerland)*
  Kushioka, J., Sun, R., Zhang, W., Muaremi, A., Leutheuser, H., Odonkor, C. A., Smuck, M.
  2022; 22 (23)
- **Biomechanical Phenotyping of Chronic Low Back Pain: Protocol for BACPAC.** *Pain medicine (Malden, Mass.)*
  Adam Quirk, D., Johnson, M. E., Anderson, D. E., Smuck, M., Sun, R., Matthew, R., Bailey, J., Marras, W. S., Bell, K. M., Darwin, J., Bowden, A. E.
  2022
- **Evaluation of Motion Segment Size as a New Sensor-based Functional Outcome Measure in Stroke Rehabilitation.** *The Journal of international medical research*
  Nam, H. S., Lee, W. H., Seo, H. G., Smuck, M. W., Kim, S.
  2022; 50 (9): 3000605221122750
- **Results of lumbar transforaminal epidural steroid injections based on the physician referral source.** *Interventional pain medicine*
  Levin, J., Li, W., Gall, N., Chan, J., Caragea, M., Huynh, L., Koltsov, J., Smuck, M.
  2022; 1 (3): 100114
- **Magnetic Resonance Imaging Characteristics Associated with Treatment Success from Basivertebral Nerve Ablation: An Aggregated Cohort Study of Multicenter Prospective Clinical Trials Data.** *Pain medicine (Malden, Mass.)*
  McCormick, Z. L., Conger, A., Smuck, M., Lotz, J. C., Hirsch, J. A., Hickman, C., Harper, K., Burnham, T. R.

2022; 23 (Supplement_2): S34-S49

- **Vertebrogenic Pain: A Paradigm Shift in Diagnosis and Treatment of Axial Low Back Pain.** *Pain medicine (Malden, Mass.)*
  Conger, A., Smuck, M., Truumees, E., Lotz, J. C., DePalma, M. J., McCormick, Z. L.
  2022; 23 (Supplement_2): S63-S71
- **Thoracic transforaminal epidural steroid injection for management of thoracic spine pain: A multicenter cross-sectional study of short-term outcomes.** *Interventional pain medicine*
  Levin, J., Chan, J., Huynh, L., Smuck, M., Koltsov, J., Kesikburun, B., Wagner, G. E., Caragea, M., Kuo, K., McCormick, Z. L., Schneider, B., Berlin, E., Kennedy, et al
  2022; 1 (1): 100004
- **Results of cervical epidural steroid injections based on the physician referral source.** *Interventional pain medicine*
  Levin, J., Gall, N., Chan, J., Huynh, L., Koltsov, J., Kennedy, D. J., Smuck, M.
  2022; 1 (1): 100001
- **Prospective, randomized, multicenter study of intraosseous basivertebral nerve ablation for the treatment of chronic low back pain: 24-Month treatment arm results.** *North American Spine Society journal*
  Koreckij, T., Kreiner, S., Khalil, J. G., Smuck, M., Markman, J., Garfin, S., INTRACEPT Trial Investigators
  2021; 8: 100089
- **What does the Patient with Back Pain Want? A Comparison of Patient Preferences and Physician Assumptions.** *The spine journal : official journal of the North American Spine Society*
  Smuck, M., Barrette, K., Martinez-Ith, A., Sultana, G., Zheng, P.
  2021
- **Examining the Association Between Self-Reported Estimates of Function and Objective Measures of Gait and Physical Capacity in Lumbar Stenosis.** *Archives of rehabilitation research and clinical translation*
  Odonkor, C. A., Taraben, S., Tomkins-Lane, C., Zhang, W., Muaremi, A., Leutheuser, H., Sun, R., Smuck, M.
  2021; 3 (3): 100147
- **PHYSICAL ACTIVITY THRESHOLDS FOR PREDICTING LONGITUDINAL GAIT DECLINE IN ADULTS WITH KNEE OSTEOARTHRITIS**
  Sun, R., Tomkins-Lane, C., Muaremi, A., Kuwabara, A., Smuck, M.
  ELSEVIER SCI LTD.2021: S17
- **Intraosseous Basivertebral Nerve Radiofrequency Ablation for the Treatment of Vertebral Body Endplate Low Back Pain: Current Evidence and Future Directions.** *Pain medicine (Malden, Mass.)*
  Michalik, A., Conger, A., Smuck, M., Maus, T. P., McCormick, Z. L.
  2021; 22 (Supplement_1): S24-S30
- **Prospective, randomized, multicenter study of intraosseous basivertebral nerve ablation for the treatment of chronic low back pain: 12-month results.** *Regional anesthesia and pain medicine*
  Smuck, M., Khalil, J., Barrette, K., Hirsch, J. A., Kreiner, S., Koreckij, T., Garfin, S., Mekhail, N., INTRACEPT Trial Investigators, Beall, D., Bainbridge, S., Khalil, J., Koreckij, T., et al
  2021
- **Physical Activity Thresholds for Predicting Longitudinal Gait Decline in adults with Knee Osteoarthritis.** *Osteoarthritis and cartilage*
  Sun, R., Tomkins-Lane, C., Muaremi, A., Kuwabara, A., Smuck, M.
  2021
- **The emerging clinical role of wearables: factors for successful implementation in healthcare.** *NPJ digital medicine*
  Smuck, M., Odonkor, C. A., Wilt, J. K., Schmidt, N., Swiernik, M. A.
  2021; 4 (1): 45
- **Contrast Flow Patterns Based on Needle Tip Position During Cervical Transforaminal Epidural Injections.** *PM & R : the journal of injury, function, and rehabilitation*
  Levin, J. n., Levi, D. n., Gall, N. n., Horn, S. n., Smuck, M. n.
  2021
- **Objective features of Sedentary Time and Light Activity Differentiate People with Low Back Pain from Healthy Controls, a Pilot Study.** *The spine journal : official journal of the North American Spine Society*
  Tomkins-Lane, C., Sun, R., Muaremi, A., Zheng, P., Mohan, M., Ith, M. A., Smuck, M.

2021

- **Skin Mountable Capillaric Strain Sensor with Ultrahigh Sensitivity and Direction Specificity** *ADVANCED MATERIALS TECHNOLOGIES*
  Rivas Yepes, L., Demir, E., Lee, J., Sun, R., Smuck, M., Araci, I.
  2020

- **Preoperative epidural steroid injections are not associated with increased rates of infection and dural tear in lumbar spine surgery.** *European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society*
  Koltsov, J. C., Smuck, M. W., Alamin, T. F., Wood, K. B., Cheng, I., Hu, S. S.
  2020

- **Predicting Poor Functional Status In Adults With Knee Osteoarthritis Using Real-life Accelerometry Data**
  Sun, R., Kuwabara, A., Tomkins-Lane, C., Smuck, M.
  LIPPINCOTT WILLIAMS & WILKINS.2020: 823–24

- **Cervical Epidural Steroid Injections: Incidence and Determinants of Subsequent Surgery.** *The spine journal : official journal of the North American Spine Society*
  Kleimeyer, J. P., Koltsov, J. C., Smuck, M. W., Wood, K. B., Cheng, I., Hu, S. S.
  2020

- **Variability among Methods and Timing of Pain Assessment Tools for Tracking Improvement of Lumbar Stenosis Patients after Surgery.** *The spine journal : official journal of the North American Spine Society*
  Tomkins-Lane, C., Zheng, P. Z., Sun, R., Smuck, M.
  2020

- **Approaching the Management of Expectations in Patients with Chronic Low Back Pain: Enthusiasm vs Realism.** *Pain medicine (Malden, Mass.)*
  McCormick, Z. L., Schneider, B. J., Prather, H., Sullivan, W., Smuck, M.
  2020

- **Consensus practice guidelines on interventions for lumbar facet joint pain from a multispecialty, international working group.** *Regional anesthesia and pain medicine*
  Cohen, S. P., Bhaskar, A., Bhatia, A., Buvanendran, A., Deer, T., Garg, S., Hooten, W. M., Hurley, R. W., Kennedy, D. J., McLean, B. C., Moon, J. Y., Narouze, S., Pangarkar, et al
  2020

- **PREDICTING DECLINE IN CLINICAL GAIT SPEED IN ADULTS WITH KNEE OSTEOARTHRITIS USING BASELINE PHYSICAL ACTIVITY DATA**
  Sun, R., Muaremi, A., Kuwabara, A., Tomkins-Lane, C., Smuck, M.
  ELSEVIER SCI LTD.2020: S314

- **Digital care for chronic musculoskeletal pain: a 10,000 user longitudinal observational study.** *Journal of medical Internet research*
  Bailey, J. F., Agarwal, V., Zheng, P., Smuck, M., Fredericson, M., Kennedy, D. J., Krauss, J.
  2020

- **Spine Nonoperative Cost Before Surgery.** *Spine*
  Schneider, B. J., Sullivan, W. n., Prather, H. n., Smuck, M. n., McCormick, Z. n.
  2020

- **Gait features for discriminating between mobility-limiting musculoskeletal disorders: Lumbar spinal stenosis and knee osteoarthritis.** *Gait & posture*
  Odonkor, C. n., Kuwabara, A. n., Tomkins-Lane, C. n., Zhang, W. n., Muaremi, A. n., Leutheuser, H. n., Sun, R. n., Smuck, M. n.
  2020; 80: 96–100

- **Modification of the Cervical Transforaminal Epidural Steroid Injection Technique Based Upon the Anatomic Angle of the Superior Articular Process on MRI.** *Pain medicine (Malden, Mass.)*
  Levi, D. n., Horn, S. n., Murphy, J. n., Smuck, M. n., Levin, J. n.
  2020

- **Incidence of Extravascular Perivertebral Artery Contrast Flow During Cervical Transforaminal Epidural Injections.** *Pain medicine (Malden, Mass.)*
  Levin, J. n., Mohan, M. n., Levi, D. n., Horn, S. n., Smuck, M. n.

2020

- **Gait features for discriminating between mobility-limiting musculoskeletal disorders: Lumbar spinal stenosis and knee osteoarthritis.** *Gait & posture*
  Odonkor, C. n., Kuwabara, A. n., Tomkins-Lane, C. n., Zhang, W. n., Muaremi, A. n., Leutheuser, H. n., Sun, R. n., Smuck, M. n.
  2020; 80: 96–100
- **Modification of the Cervical Transforaminal Epidural Steroid Injection Technique Based Upon the Anatomic Angle of the Superior Articular Process on MRI.** *Pain medicine (Malden, Mass.)*
  Levi, D. n., Horn, S. n., Murphy, J. n., Smuck, M. n., Levin, J. n.
  2020
- **Smoking Is Associated with Pain in All Body Regions, with Greatest Influence on Spinal Pain.** *Pain medicine (Malden, Mass.)*
  Smuck, M., Schneider, B. J., Ehsanian, R., Martin, E., Kao, M. J.
  2019
- **A Prospective, Randomized, Multi-Center Study of Intraosseous Basivertebral Nerve Ablation for the Treatment of Chronic Low Back Pain.** *The spine journal : official journal of the North American Spine Society*
  Khalil, J., Smuck, M., Koreckij, T., Keel, J., Beall, D., Goodman, B., Kalapos, P., Nguyen, D., Garfin, S., INTRACEPT Trial Investigators
  2019
- **Effect of Injectate Viscosity on Epidural Distribution in Lumbar Transforaminal Epidural Steroid Injection.** *Pain research & management*
  Choi, J., Kim, N., Smuck, M., Lee, S. H.
  2019; 2019: 2651504
- **Lumbar epidural steroid injections for herniation and stenosis: incidence and risk factors of subsequent surgery** *SPINE JOURNAL*
  Koltsov, J. C. B., Smuck, M. W., Zagel, A., Alamin, T. F., Wood, K. B., Cheng, I., Hu, S. S.
  2019; 19 (2): 199–205
- **Intra-articular Steroids vs Saline for Lumbar Z-Joint Pain: A Prospective, Randomized, Double-Blind Placebo-Controlled Trial** *PAIN MEDICINE*
  Kennedy, D. J., Fraiser, R., Zheng, P., Huynh, L., Levin, J., Smuck, M., Schneider, B. J.
  2019; 20 (2): 246–51
- **Does the presence of the fibronectin-aggrecan complex predict outcomes from lumbar discectomy for disc herniation?** *SPINE JOURNAL*
  Smith, M. W., Ith, A., Carragee, E. J., Cheng, I., Alamin, T. F., Golish, S., Mitsunaga, K., Scuderi, G. J., Smuck, M.
  2019; 19 (2): E28–E33
- **Effect of Injectate Viscosity on Epidural Distribution in Lumbar Transforaminal Epidural Steroid Injection** *Pain Research and Management*
  Choi, J., Kim, N., Smuck, M., Lee, S.
  2019; 2019: 6
- **Digital biomarkers of spine and musculoskeletal disease from accelerometers: Defining phenotypes of free-living physical activity in knee osteoarthritis and lumbar spinal stenosis** *SPINE JOURNAL*
  Tomkins-Lane, C., Norden, J., Sinha, A., Hu, R., Smuck, M.
  2019; 19 (1): 15–23
- **Intra-articular Steroids vs Saline for Lumbar Z-Joint Pain: A Prospective, Randomized, Double-Blind Placebo-Controlled Trial.** *Pain medicine (Malden, Mass.)*
  Kennedy, D. J., Fraiser, R., Zheng, P., Huynh, L., Levin, J., Smuck, M., Schneider, B. J.
  2018
- **Guidelines for Composing and Assessing a Paper on the Treatment of Pain: A Practical Application of Evidence-Based Medicine Principles to the Mint Randomized Clinical Trials** *PAIN MEDICINE*
  McCormick, Z. L., Vorobeychik, Y., Gill, J. S., Kao, M. J., Duszynski, B., Smuck, M., Stojanovic, M. P.
  2018; 19 (11): 2127–37
- **Gait Symmetry Assessment with a Low Back 3D Accelerometer in Post-Stroke Patients.** *Sensors (Basel, Switzerland)*
  Zhang, W., Smuck, M., Legault, C., Ith, M. A., Muaremi, A., Aminian, K.
  2018; 18 (10)

- **Corticosteroid Injections Into Lumbar Facet Joints: A Prospective, Randomized, Double-Blind Placebo-Controlled Trial** *AMERICAN JOURNAL OF PHYSICAL MEDICINE & REHABILITATION*
  Kennedy, D. J., Huynh, L., Wong, J., Mattie, R., Levin, J., Smuck, M., Schneider, B. J.
  2018; 97 (10): 741–46
- **Gait Symmetry Assessment with a Low Back 3D Accelerometer in Post-Stroke Patients** *SENSORS*
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