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Engineering & Scientific Consulting

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Professional Profile

Dr. Karim Khattab is a bioengineer and clinical researcher specializing in digital health, wearables, pain psychology, and movement biomechanics. Dr. Khattab has 6+ years of experience designing and leading clinical studies and applying advanced statistical methods to wearable and clinical bio-behavioral data to develop novel biomarkers, health metrics, and functional tests.

Prior to joining Exponent, Dr. Khattab was a postdoctoral researcher in the Digital Orthopedics Lab at UC San Francisco, where he developed pipelines to collect, process, and analyze time-series bio-behavioral data from wearables and psychosocial surveying. His work focused on characterizing pain experience in chronic low back pain using wearable-derived measures of activity, heart rate and heart rate variability. He applies this expertise to evaluating and validating digital health technologies, designing clinical studies and interpreting complex bio-behavioral datasets.

Dr. Khattab earned a joint Ph.D. in Bioengineering from UC Berkeley and UC San Francisco. His doctoral research focused on phenotyping chronic musculoskeletal pain patients by developing and employing novel markers of muscle quality, movement patterns and bio-behavioral characteristics. Using a spatial analysis approach to quantify muscle fat infiltration, Dr. Khattab developed a novel muscle quality biomarker characterizing accelerated degeneration in chronic low back pain.

Dr. Khattab has strong programming skills in Python, R, and MATLAB for machine learning, signal processing, and time-series data analysis of physiological signals. He has experience with a wide array of sensors including smartwatches, electromyography (EMG), inertial measurement units (IMUs), and optical motion capture systems, as well as with pain and psychosocial surveying. As an NIH Clinical Pain Research trainee, Dr. Khattab has a strong translational research background in human subjects research. integrating both quantitative and qualitative measures of health, movement, and pain. He has extensive experience in study design across multiple health domains including activity, heart rate, muscle quality, pain, and psychosocial factors.

Academic Credentials & Professional Honors

Ph.D., Bioengineering, University of California, San Francisco, 2024

B.S., Mechanical Engineering, Louisiana State University, 2019

NIH Training Fellowship in Clinical Pain Research

Prior Experience

Postdoctoral Researcher, UC San Francisco Digital Orthopedics Lab, 2025

Graduate Researcher, UC Berkeley – UC San Francisco, 2019-2024

Professional Affiliations

Orthopedic Research Society, 2019-2025

Publications

Khattab K, Dziesinski LK, Zhou J, Scheffler A, Fields AJ, O'Neill CW, Lotz JC, Bailey JF. Chronicity and physical activity levels independently associate with spatial patterns of multifidus fat infiltration in chronic low back pain patients. Eur Spine J 2025.

Khattab K, Dziesinski LK, Ornowski J, Zhou J, Bonnheim NB, Crawford R, Scheffler A, Fields AJ, O'Neill CW, Lotz JC, Bailey JF. Spatial patterns of fat within the deep multifidus as a biomarker for chronic low back pain. Spine J 2025.

Halvorson RT, Archibeck E, Khattab K, Ngwe H, Ornowski J, Akkaya Z, Souza RB, O'Connell GD, Lotz JC, Diaz C, Vail TP, Bailey JF. Early biomechanical recovery following total hip arthroplasty is associated with preoperative hip muscle fat-fraction. Journal of Orthopaedic Research 2025; 43: 1113–1121.

Archibeck E, Strigo I, Scheffler A, Torres-Espin A, Khattab K, Silvestros P, Matthew R, Regan C, Hodges P, O'Neill C, Lotz JC, O'Connell G, Bailey J. Sex-based differences in biomechanical function for chronic low back pain and how it relates to pain experience. Eur Spine J 2025; 34:2377–2386.

Khattab K, Dziesinski LK, Crawford R, Ballatori A, Nyayapati P, Krug R, Fields A, O'Neill CW, Lotz JC, Bailey JF. Spatial distribution of fat infiltration within the paraspinal muscles: implications for chronic low back pain. Eur Spine J 2022; 31:2875–2883.

Halvorson RT, Castillo FT, Ahamed F, Khattab K, Scheffler A, Matthew R, Lotz J, Vail TP, Feeley BT, Bailey JF. Point-of-care motion capture and biomechanical assessment improve clinical utility of dynamic balance testing for lower extremity osteoarthritis. PLOS Digital Health 2022; 1(7):e0000068.

McNamara KP, Greene KA, Tooze JA, Dang J, Khattab K, Lenchik L, Weaver AA. Neck muscle changes following long-duration spaceflight. Front Physiol. 2019;10:1115.

Presentations

Khattab K., Di Rinaldis E, Hue T, Zheng P, Torres-Espin A, Lotz JC, Bailey JF. Local temporal variability in physical activity may be more important for episodic pain trajectory classification than patient-reported outcomes and summary measures of activity: implications for objective patient tracking. Oral Presentation, International Society of Study of the Lumbar Spine (ISSLS) Conference, Milan, Italy, 2024.

Khattab K., Dziesinski LK, Ornowski J, Zhou J, O'Neill CW, Bonnheim NB, Fields AJ, Torres-Espin A, Lotz JC, Bailey JF. Pain-related patterns of multifidus fat infiltration are spatially distinct from age-related and BMI-related patterns of fat infiltration. Special Poster presentation, International Society of Study of the Lumbar Spine (ISSLS) Conference, Milan, Italy, 2024.

Khattab K, Dziesinski LK, O'Neill CW, Lotz JC, Bailey JF. Linking paraspinal muscle quality and biomechanical function during dynamic tasks in chronic low back pain. Special Poster presentation, International Society of Study of the Lumbar Spine (ISSLS) Conference, Melbourne, Australia, 2023.

Khattab K, Ngwe H, Matthew R, Lotz JC, Vail T, Bailey JF. Staggered stance sit-to-stand as a functional

assessment for total hip arthroplasty patients. Poster Presentation, Orthopedic Research Society (ORS) Conference, Dallas, TX, 2023.

Khattab K, Dziesinski LK, Crawford R, Ballatori A, Nyayapati P, Krug R, Fields A, O'Neill CW, Lotz JC, Bailey JF. Spatial distribution of fat infiltration within the paraspinal muscles: implications for chronic low back pain. Oral Presentation, International Society of Study of the Lumbar Spine (ISSLS) Conference, Boston, MA, 2022.

Khattab K, Dziesinski LK, Ballatori A, Nyayapati P, Crawford R, Krug R, Fields A, O'Neill CW, Lotz JC, Bailey JF. Spatial distribution of fat within the multifidus: implications relative to spinal biomechanics and discogenic pain. Oral Presentation, Orthopedic Research Society (ORS) Conference, Tampa Bay, FL, 2022.