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EDUCATION

2022-2024 Ph.D. in Department of Industrial Manufacturing and Systems Engineering, Iowa State University, Ames, Iowa, USA

Dissertation Title – "Creep Deformation of Viscoelastic Lumbar Tissue and Its Implications in Electromyography-Assisted Biomechanical Modeling"

2019-2021 M.S. in Department of Industrial Engineering, Pusan National University, Busan, Republic of Korea

Thesis Title – "Cost-Benefit of Physical and Cognitive Workload in Low Back Pain Developers while Sitting and Standing"

2014-2019 B.S. in Department of Industrial Engineering, Pusan National University, Busan, Republic of Korea

Thesis Title – "Effect of Standing Desk Use on Cognitive Performance and Physical Workload while Engaged with High Cognitive Demand Tasks"

PROFESSIONAL EXPERIENCE

2024 - Present <u>Assistant Professor</u>
Department of Industrial and Entrepreneurial Engineering and Engineering Management, Western Michigan University

2022 - 2024 <u>Graduate Research/Teaching Assistant</u>
Department of Industrial Manufacturing and Systems Engineering, Iowa State University

2021 - 2021 <u>Research Associate</u>
The Human and Safety Engineering Lab, Department of Industrial Engineering, Pusan National University

2019 - 2021 <u>Graduate Research Assistant</u>
Department of Industrial Engineering, Pusan National University

2017 - 2019 <u>Undergraduate Research Assistant</u>
Department of Industrial Engineering, Pusan National University

RESEARCH INTEREST

Spine Biomechanics, Ergonomic Intervention Effectiveness Research, Biomechanical Modeling, Physical-Cognitive Interaction

PUBLICATIONS

** Corresponding author; [1] Co-first author*

Published Journal Articles

1. Kang SH* and Mirka GA (2025). "Creep deformation of the viscoelastic lumbar tissues: Effects of trunk flexion posture, exposure-recovery schedule, and individual flexibility", *Journal of Biomechanics*. 184, 112675, https://doi.org/10.1016/j.jbiomech.2025.112675
2. Kang SH* and Mirka GA (2025) "Load transfer between active and passive lumbar tissues and its implications in time-dependent EMG-assisted biomechanical modeling", *Journal of Biomechanics*. 183, 112600, https://doi.org/10.1016/j.jbiomech.2025.112600
3. Kang SH* and Mirka GA (2025). "Creep deformation of viscoelastic lumbar tissue and its implication in biomechanical modeling of the lumbar spine", *Journal of Biomechanics*. 182, 112595, https://doi.org/10.1016/j.jbiomech.2025.112595
4. Kang SH*, Wolf E, Lowe L, and Mirka GA (2025) "Effects of a passive back-support exosuit on objective and subjective measures of human performance during a simulated bush-crop harvesting task", *Journal of Agromedicine,* https://doi.org/10.1080/1059924X.2025.2470257
5. Kang SH* and Mirka, GA (2024) "Cumulative creep response of viscoelastic lumbar tissue as a function of work-rest schedule", *Journal of Electromyography and Kinesiology*, 78, 102916. https://doi.org/10.1016/j.jelekin.2024.102916
6. Kim J[1], Kang SH[1]*, Li J, Mirka, GA and Dorneich, CM (2024) "Effects of a Passive Back-Support Exosuit on Postural Control and Cognitive Performance During a Fatigue-Inducing Posture Maintenance Task", *Human Factors*. https://doi.org/10.1177/00187208231221890
7. Kang SH*, Lynch L, Wolf E and Mirka GA (2023) "Quantifying the effectiveness of a passive trunk-support exosuit at reducing erector spinae muscle fatigue during a quasi-static posture maintenance task", *Ergonomics*. https://doi.org/10.1080/00140139.2023.2295214
8. Kang SH* and Mirka GA (2023) "Effects of a passive back-support exosuit on erector spinae and abdominal muscle activity during asymmetric trunk posture maintenance tasks", *Human Factors.* https://doi.org/10.1177/00187208231197264
9. Kang SH* and Mirka GA (2023) "Effect of trunk flexion angle and time on lumbar and abdominal muscle activity while wearing a passive back-support exosuit device during simple posture-maintenance tasks", *Ergonomics*, 1-28. https://doi.org/10.1080/00140139.2023.2191908
10. Kang SH* and Mirka GA (2023) "Creep deformation of viscoelastic lumbar tissue during sustained submaximal trunk flexion postures", *Journal of Biomechanics*, 115, 111647. https://doi.org/10.1016/j.jbiomech.2023.111647
11. Zou H, Choi J, Kang SH, Kim S and Jin S* (2023) "Passive exoskeletons alter low back transfer mechanism", *Journal of Biomechanics*, 147, 111437. https://doi.org/10.1016/j.jbiomech.2023.111437
12. Lee I, Choi J, Kang SH and Jin S* (2023) "Alternative to reduced stresses on the upper extremity in a standing workstation", *Human Factors*, 00187208211057349. https://doi.org/10.1177/00187208211057349
13. Kim S, Lee I, Kang SH and Jin S* (2023) "Significance of lower body postures in chair design", *Human Factors*, 64(4), 575-591. https://doi.org/10.1177/00187208211027020
14. Kang SH, Lee J and Jin S* (2021) "Effect of standing desk use on cognitive performance and physical workload while engaged with high cognitive demand tasks", *Applied Ergonomics*, 92, 103306. https://doi.org/10.1016/j.apergo.2020.103306

Submitted Journal Articles

15. Kang SH* (In Review) "Influence of individual flexibility on the effectiveness of a passive back-support exosuit in reducing erector spinae muscle activity: An exploratory study", *International Journal of Industrial*

Ergonomics.

16. Kang SH* (In Review) "Effects of individual hamstring flexibility and trunk flexion posture on the creep deformation of viscoelastic lumbar tissues", *Journal of Biomechanics.*

Journal Articles In-Preparation

17. Kang SH* and Mirka, GA (In Development) "Toward a more precision quantification of the onset and cessation of the flexion-relaxation phenomenon in erector spinae muscles: a technical note", To be submitted to *Journal of Biomechanics*.
18. Kang SH, Norasi H, Tetteh E, Hallbeck MS and Mirka, GA* (In Development) "A Systematic Review on Causation of Musculoskeletal Neck and Back Pain in Prolonged Static Posture", To be submitted to *Ergonomics*.
19. Choi J, Kang SH and Jin S* (In Development) "The postural strategies with increased contact points in prolonged standing", To be submitted to *Journal of Safety Research.*
20. Kang SH, Kim D and Jin S* (In Development) "Design principle of pulling physical use interface applying Kansei engineering", To be submitted to *Universal Access in the Information Society*.
21. Kang SH*, Hotopp A and Lecznar, A (In Development) "Effects of harvesting postures and sloped ground on the effectiveness of a passive back-support exosuit in reducing active and passive tissue moments", To be submitted to *Ergonomics*.

CONFERENCE PROCEEDING

1. Kang SH, Choi J, Zou H and Jin S (2020) "Cost-benefit of physical and cognitive workload in low back pain developers while sitting and standing", Proceeding of Ergonomics society of Korea. 2020.10, 19-23.
2. Kang SH, Lee I and Jin S (2020) "Providing an affective design for a door-pulling physical user interface", Proceeding of Ergonomics society of Korea. 2020.06, 37-50.
3. Choi J, Kang SH and Jin S (2021) "An ergonomics intervention to minimize the biomechanical cost in standing workstation", Proceeding of Ergonomics society of Korea. 2021.06, 17-20.
4. Zou H, Kim S, Kang SH, Choi J and Jin S (2021) "How passive exoskeletons effect on the low back load transfer mechanism", Proceeding of Ergonomics society of Korea. 2021.06, 30.
5. Kang SH, Lee J and Jin S (2019) "Effects of standing desk use on cognitive distraction and physical workload", Proceeding of Ergonomics society of Korea. 2019.10, 69-73.
6. Kim S, Lee I, Kang SH and Jin S (2019) "The effect of lower extremity postures and prolonged sitting on the trunk biomechanics", Proceeding of Ergonomics society of Korea. 2019.05, 4-8.

SELECTED RESEARCH EXPERIENCE

1. Cumulative creep response of viscoelastic lumbar tissue in near full flexion and full flexion postures (Sep. 2022 – Aug. 2024)
   - To examine the effect of trunk flexion angle and work-rest schedule on creep deformation of viscoelastic lumbar tissue.
   - My role: lead a series of studies and served as a corresponding author (1-3, 5, 10 in PUBLICATIONS).

2. Evaluation of the effectiveness of the wearable back-support system at reducing the low back stress in the healthcare industry—with a particular focus on surgeons (Jan. 2022 – Dec. 2023)
   - To evaluate the effectiveness of a passive back-support exosuit as a function of trunk flexion angle, asymmetry of trunk posture, leg restriction, and time.
   - My role: lead four series of studies and served as a corresponding author (6-9 in PUBLICATIONS).

3. Investigation of risk factors for musculoskeletal disorders in last-mile service industry (Funded by *Coupang*, Jul. 2021-Nov.2021)

- To define unit work and evaluation method for systematic analysis/management of Coupang and to investigate risk factors for musculoskeletal disorders in last-mile service industry.
- My role: defining unit work for atypical work; assessing subjective workload; quantifying physiological measures in field environment; and performing statistical analysis (Kruskal-Wallis rank sum test) for survey.

4. Evaluating the effectiveness of sit-stand workstation intervention from the perspective of biomechanics and cognitive engineering (Funded by *National Research Foundation of Korea*, Feb. 2020 – Nov. 2022)
   - To investigate physical and cognitive workload while engaged in the sit-stand workstation.
   - My role: developing cognitive tests using MATLAB; designing the experiment, performing kinematic, kinetic, and EMG analysis; performing statistical analysis (ANOVA).

5. Development of a guideline of refrigerator auto door considering emotional satisfaction and usability (Funded by *LG Electronics*, Nov. 2019 – Feb. 2021)
   - To extract physical properties for door open motion and understand the relationship with user emotion.
   - My role: measuring IMU data for benchmarking products; designing the experiment; performing statistical analysis using Minitab and R studio (ANOVA, Multiple/Linear regression, and Pearson correlation).

6. Development of a guideline of washing machine door considering user's emotion (Funded by *LG Electronics*, Jan. 2019 – Oct. 2019)
   - To identify the relation between the physical variables and subjective perceptions, and to provided design recommendations.
   - My role: designing the experiment; performing statistical analysis (Principal component analysis, Factor analysis, and Multiple regression).

TEACHING EXPERIENCE

1. **Instructor** for Ergonomics and Occupational Biomechanics (IEE6420) (Western Michigan University, Spring 2025)
2. **Instructor** for Work Analysis (EM3050) (Western Michigan University, Fall 2024)
3. **Instructor** for Work Analysis and Design Lab (EM3150) (Western Michigan University, Fall 2024)
4. Mentoring **three** master's course graduate students (Western Michigan University, 2024-Present)
5. **Teaching Assistant** for Applied Ergonomics and Work Design (IE271) (Iowa State University, Spring 2024)
6. **Guest lecturer** for Applied Ergonomics and Work Design (IE271) (Iowa State University, Spring 2024)
7. Mentoring **four** undergraduate research assistants (Iowa State University, 2022-2023)
8. Mentoring **one** master's course graduate student during the period as a research associate in the Human and Safety Engineering laboratory (Pusan National University, 2021)
9. Mentoring **two** undergraduate team in capstone design class (Pusan National University, 2019)
10. Mentoring Program for Multicultural Family Students: Math and English teacher (Korea Student Aid Foundation, 2017)
11. Math teacher for underprivileged or minority students (Midam Scholarship Association, 2014)

HONOR, AWARD, CERTIFICATION & SCHOLARSHIP

1. Research Excellence Award in Recognition of Outstanding Research Accomplishments in a Graduate Program, College of Engineering, Iowa State University (May 2024)
2. A member of Tau Beta Pi—The Engineering Honors Society (2023-2024)
3. Best Paper/Presentation Award (Ergonomics Society of Korea, 2020)
4. The first prize on a Graduate project in the Department of Industrial Engineering at Pusan National

University (2019)

5. National Science and Engineering Undergraduate Scholarship (Korea Student Aid Foundation, 2018-2019): Awarded full scholarship by the Korean government for two years at the university

PROFESSIONAL PRESENTATIONS

1. "Viscoelastic creep in lumbar tissues: Implications for biomechanical modeling", Human Factors and Ergonomics Society (HFES), Expected, 2025.
2. "Load transfer between lumbar tissues: Implications for biomechanical modeling", Human Factors and Ergonomics Society (HFES), Expected, 2025.
3. "Lumbar spinal creep as a function of individual flexibility", International Conference on Industrial and Systems Engineering (IISE), Expected, 2025.
4. "Towards an introduction of a lumbar-assist exoskeleton in the agriculture industry: A pilot test", International Conference on Industrial and Systems Engineering (IISE), Expected, 2025.
5. "Influence of individual flexibility on the effectiveness of a lumbar-assist exoskeleton in reducing lumbar extensor muscle activity", International Conference on Industrial and Systems Engineering (IISE), Expected, 2025.
6. "Lumbar spinal creep as a function of work-rest schedule", 22nd Triennial Congress of the International Ergonomics Association (IEA), August 27, 2024.
7. "Does lumbar spinal creep occur in near full flexion?", 22nd Triennial Congress of the International Ergonomics Association (IEA), August 27, 2024.
8. "Basic Science and Applied Research Focusing on Static Awkward Trunk Flexion Postures", Invited talk in the Department of Industrial and Entrepreneurial Engineering and Engineering Management, Western Michigan University, April 10th, 2024.
9. "Basic Science and Applied Research Focusing on Static Awkward Trunk Flexion Postures", Seminar in the Department of Industrial and Manufacturing Systems Engineering, Iowa State University, February 21st, 2024.
10. "Extreme Trunk Flexion Postures: Biomechanical Modeling and Exoskeleton Interventions", Invited talk in the Department of Kinesiology, Iowa State University, February 9th, 2024.
11. "Basic Science and Applied Research Focusing on Static Awkward Trunk Flexion Postures", Invited talk in the Department of Industrial and Operation Engineering, University of Michigan, February 1st, 2024.
12. "Creep deformation of viscoelastic lumbar tissue during submaximal trunk flexion", Poster Symposium at the Human Factors and Ergonomics Society (HFES), October 25th, 2023.
13. "Effects of a Passive Back-Support Exosuit on Erector Spinae and Abdominal Muscle Activity during Static Trunk Posture Maintenance Tasks: the Application of the Surgical Environment", Seminar in the Department of Kinesiology, Iowa State University, March 9th, 2023.
14. "Cost-Benefit of Physical and Cognitive Workload in Low Back Pain Developers while Sitting and Standing", Presented at the Ergonomics Society of Korea Fall Conference and Workshop, Jeju, South Korea, October 29, 2020.
15. "Providing an affective design for a door-pulling physical user interface", Presented at the Ergonomics Society of Korea Spring Conference and Workshop, South Korea, June 29, 2020.
16. "Effects of standing desk use on cognitive distraction and physical workload", Presented at the Ergonomics Society of Korea Fall Conference and Workshop, Busan, South Korea, October 17, 2019.

GRANTS

1. Title: Exoskeleton Intervention in Agriculture Industry
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: National Institute for Occupational Safety and Health (NIOSH)

Research Grant: NIOSH-R03
Funding Amount: $49,609 (pending)

2. Title: Exoskeleton Intervention in Roofing Industry
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: National Institute for Occupational Safety and Health (NIOSH)
   Research Grant: NIOSH-R21
   Funding Amount: $196,585 (pending)

3. Title: Why Older Drivers Think They're Safe: Understanding Michigan Older Drivers Through Caregivers
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: The Michigan Office of Highway Safety and Planning (OHSP)
   Research Grant: Drivers ages 65 and older program
   Funding Amount: $114,114 (pending)

4. Title: Ergonomic Intervention in Surgical Environment
   Investigators: Sang Hyeon Kang (Co-I)
   Granting Agency: National Institute of Health (NIH)
   Research Grant: NIH-SBIR
   Funding Amount: $291,485 (pending)

5. Title: Towards an Introduction of Back-Support Exoskeletons in Agricultural Industry
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: Western Michigan University
   Research Grant: Faculty Research and Creative Activities Award (FRACAA)
   Funding Amount: $9,981 (pending)

6. Title: Biomechanical Evaluation of Back-Support Exoskeleton in Agricultural Harvesting Postures
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: Western Michigan University
   Research Grant: Support for Faculty Scholars Award (SFSA)
   Funding Amount: $1,959 (pending)

7. Title: Evaluation of Near Full or Full Flexion Trunk Postures
   Investigators: Sang Hyeon Kang (PI)
   Granting Agency: National Institute for Occupational Safety and Health (NIOSH)
   Research Grant: NIOSH-K01
   Funding Amount: $300,000
   Expected submission date: Dec. 2025

SERVICE

1. Reviewer for a book published by CRC Press/Taylor & Francis (2025)
2. Reviewer for the CDC/NIOSH Heartland Center for Occupational Health & Safety (2024)
3. Reviewer for *The British Medical Journal* (2023-Present)
4. Reviewer for *Journal of Biomechanics* (2024-Present)
5. Reviewer for *Ergonomics* (2023-Present)
6. Reviewer for *International Journal of Industrial Ergonomics* (2022-Present)

7. Reviewer for *Sensors* (2025-Present)
8. Member of Human Factors and Ergonomics Society (2023-Present)
9. Member of Korean Human Factors and Ergonomics Society (2019-2021)

SKILLS & OTHERS

Bioinstrumentation

1. Bagnoli Surface Electromyography system (DELSYS, Inc.)
2. Trigno wireless biofeedback system (DELSYS, Inc.)
3. Xsens MTw Awinda
4. OptiTrack Motion Capture System (NaturalPoint, Inc.)
5. Force Platform System (OR6-7-2000, AMTI; Bertec Inc)
6. Lumbar Motion Monitor (Chattanooga Group Inc)

Statistical and data analysis

1. R-studio®
2. Minitab®
3. JMP®
4. SPSS®
5. MATLAB®