

# Creating a Safe Environment for Providers During Horizontal Patient Transfer.

THE UNIVERSITY OF  
**ALABAMA**<sup>®</sup>

*Capstone College of  
Nursing*

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- University of Kentucky Biomechanics Lab
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- Capstone College of Nursing

# Conflict of Interest

- No conflict of interest exists for any of the authors of this presentation

# Background

- Healthcare workers have a much higher incidence of musculoskeletal injury related to the rest of the general workforce.<sup>1</sup>
  - General worker population- 30.5 per 10,000
  - Nursing- 166.3 per 10,000
  - EMS- 187.4 per 10,000
- The purpose of this study was to identify biomechanical flaws in the horizontal transfer of a patient.

1. Bureau of Labor Statistics, *Injuries, Illnesses, and Fatalities*. 2018 11/8/2018 [cited 2018 12/17/2018]; Available from: <https://www.bls.gov/iif/soii-chart-data-2017.htm>.

# Purpose

- Not much literature exists for the best practice for performing this movement.
- The purpose of this study was to identify biomechanical flaws in the horizontal transfer of a patient.
- The main objective of this study is to understand factors contributing to musculoskeletal injury using motion capture technology.

# Methods

- A non-experimental observational research design
- Convenience sample of nursing students ( $n=11$ ) and EMS professionals ( $n=4$ ).

	Age	Sex	Height (cm)	Weight (kg)	BMI
Subject 1	21	Female	162.6	54	20.6
Subject 2	21	Female	165.1	54	20
Subject 3	32	Female	157.5	79	31
Subject 4	21	Female	175.3	81	26.6
Subject 5	22	Female	170.2	68	23.5
Subject 6	40	Male	182.9	88	26.4
Subject 7	31	Female	154.9	49	20.8
Subject 8	33	Male	180.3	79.5	24.4
Subject 9	22	Female	165.1	63	23.3
Subject 10	40	Male	192.2	110	29.8
Subject 11	37	Male	175.3	88	28.8
Subject 12	22	Female	170.2	70	25.4
Subject 13	22	Female	157.5	73	29.6
Subject 14	27	Female	162.6	69	26.1
Subject 15	21	Female	172.7	77	26.2
Average Female	23.8	n=11	164.9	67	24.8
Average Male	37.5	n=4	142.1	91.4	27.4
Average Whole	27.5	n=15	169.6	73.5	25.5

# The Movement

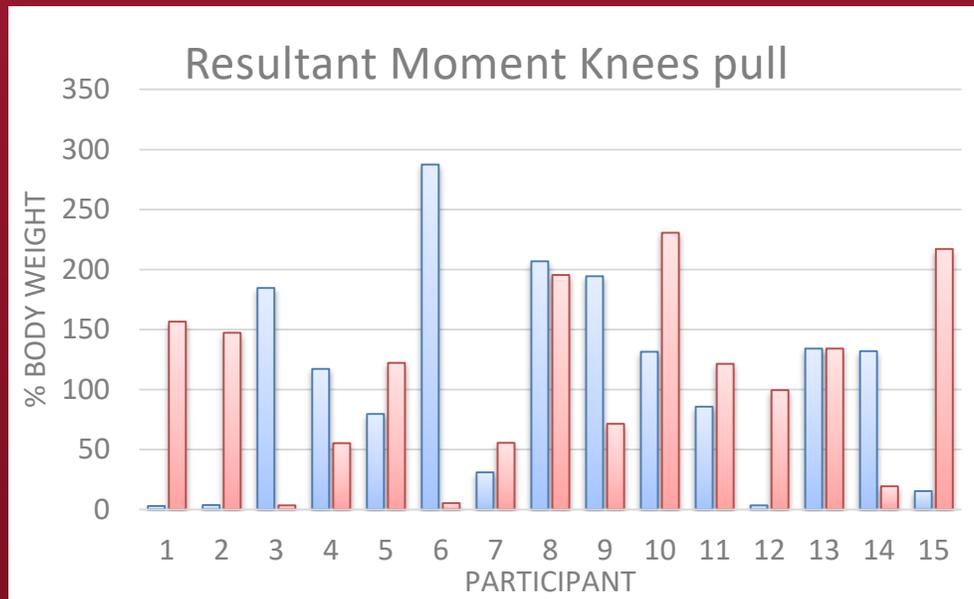
- Participants performed a horizontal transfer of a 75 kg simulated patient.
  - Moments and angles of the ankles, knees, hips, and waist
  - The rotations of the pelvis and trunk



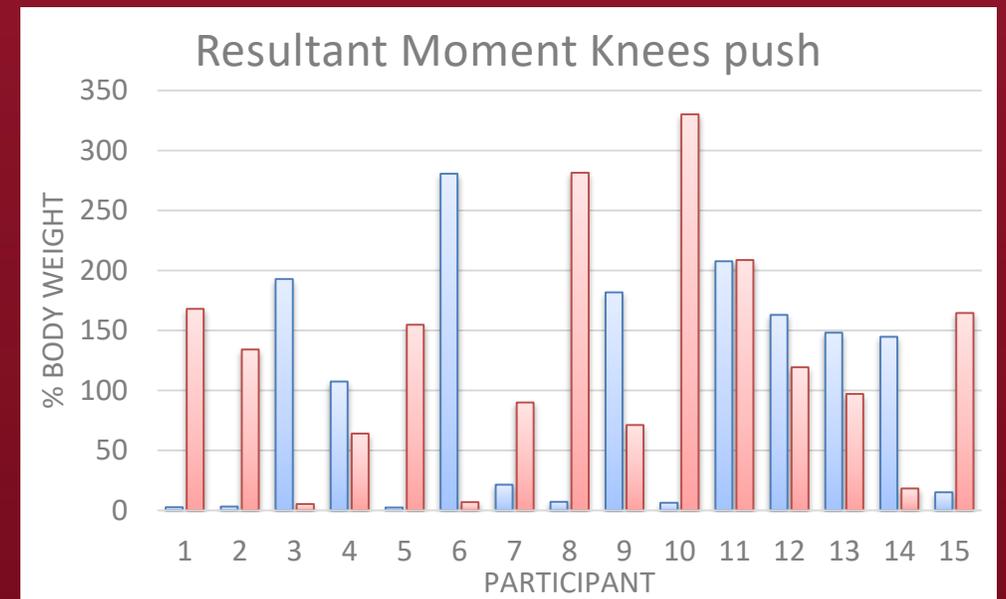
# Results

- Three specific biomechanical risk factors were identified:
  - Asymmetrical lifting technique,
  - Valgus knee during the lift, and
  - Moments in all three planes of the waist

# Asymmetric lifting technique

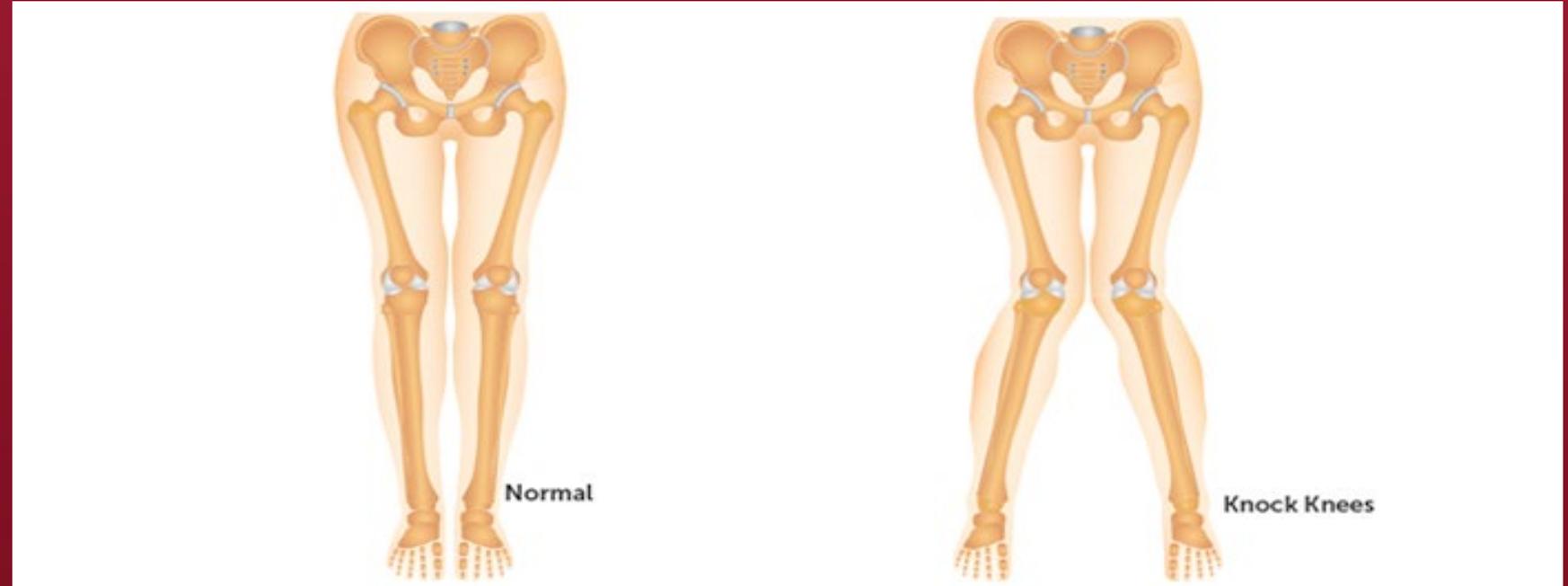


- Average resultant moments



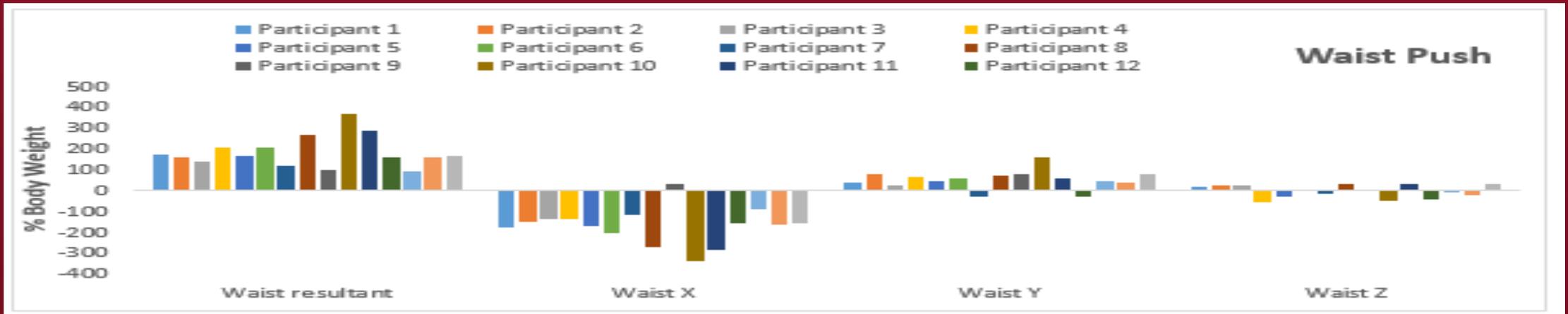
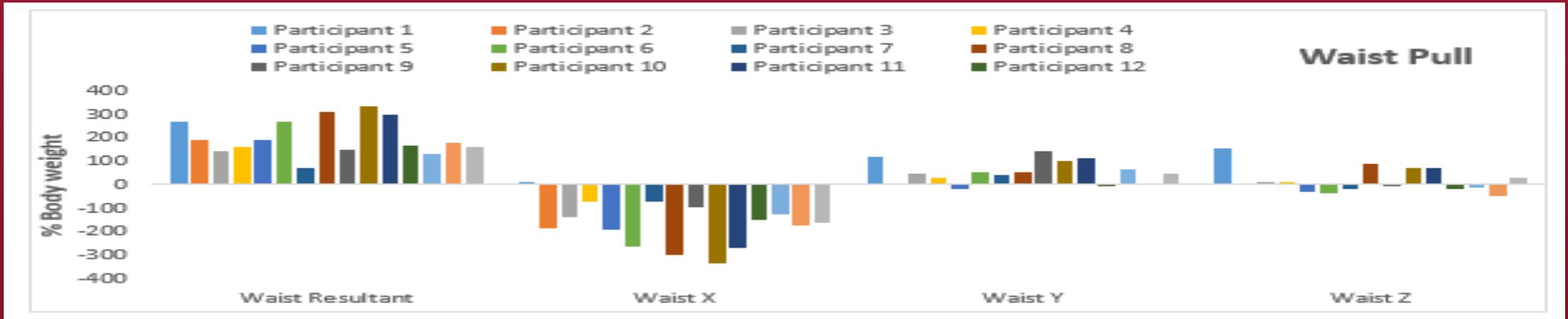
# Valgus Knee

- Every lift had Valgus Knee
- Knee Position changes:
  - Head of Femur relocated within acetabulum<sup>2</sup>
  - Moment on the pelvis is shifted
  - In theory, altered distribution of force on the lumbar spine.



2. Floyd, R.T., *Manual of Structural Kinesiology*. 18th ed, ed. C. Johnson. 2012, New Yourk, NY: The McGraw Hill Companies. 408.

# Moments about the waist



# Discussion

- Asymmetrical lifting technique creates an uneven loading of the joints of the lower extremities, pelvis, and lumbar spine
- Valgus knee increases risk of injury in knees, hips, and lower back
- Moments about the waist are uneven, meaning an uneven loading on the lumbar spine, increasing risk of injury

# Conclusion

- Some limitations include the lack of correlation between lifting techniques and the lumbar spine, no procedures were in place to correct the improper lifting, and no generalizability could be determined due lack of scope.
- By confirming these faults in the horizontal transfer, it allows for further improvement in technique.
- Future studies will attempt to determine the effects of the valgus knee on the lumbar spine and to contrast even-loading lifting vs. one leg lifting.