USING A SENSOR-BASED MONITORING SYSTEM TO IMPROVE BODY MECHANICS
MEMBERS OF THE TEAM

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OTHER PARTNER

Local Nursing Facility that had assisted living, skilled nursing and Alzheimer's units
• No conflicts of interest

• This project was completed with a grant from the Ohio Occupational Safety & Health Research Program administered by the Ohio Bureau of Workers’ Compensation (BWC)
• Health professionals have an increased risk for injuries

• High incidence of lower back pain

• Heavy physical work, bending and twisting

• Thirty-eight percent of nurses’ report having occupational-related back pain severe enough to require leave from work (Gropelli, 2011)
CONCERNS

• Incidence rate of musculoskeletal injury per 10,000 full-time nursing assistant workers in 2016 was 181.1 (US Bureau of Labor Statistics, 2017)

• Number of days away from work and work restrictions for nursing assistants was 19,560 (US Bureau of Labor Statistics, 2017)
CONCERNS

• Increasing obesity rate

• Lack of proper lifts or working equipment (Gucet, Gaitens, Oliver & McDiarmid, 2013)

• Cumulative weight lifted by a nurse in an 8-hour shift is equivalent to 1.8 tons (Muhammad, 2013)
• Patient equipment not available (Kanaskie & Snyder, 2018)

• Lack of policies (American Nurse Association, 2016)

• Lack of proper training programs (American Nurse Association, 2016)
Design an effective system to help improve body mechanic awareness in the workplace
METHOD

• Development of a compliance monitoring and feedback system
• Pilot program implementing the real-time motion tracking device
• One day training activity using the feedback system
MONITORING AND FEEDBACK SYSTEM

Kinect Sensors
Computer (Kinect Server)
Wearable Device
Wifi
Bluetooth
HTTP/JSON
AppMessage (Pebble Phone App)
PARTICIPANTS

- Seven STNA’s who were full time employees participated
- During their shift, wore a smart watch
- Only followed the STNA when in one of the 4 approved rooms
- Registered incorrect movements
## Summary of the Field Study Result

<table>
<thead>
<tr>
<th>Room Number</th>
<th>Total Registered Duration</th>
<th>Total Wrong Activity Duration</th>
<th>Total Number of Wrong Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.268 hours</td>
<td>0.279 hours</td>
<td>427</td>
</tr>
<tr>
<td>2</td>
<td>3.526 hours</td>
<td>0.034 hours</td>
<td>575</td>
</tr>
<tr>
<td>3</td>
<td>1.486 hours</td>
<td>0.321 hours</td>
<td>345</td>
</tr>
<tr>
<td>4</td>
<td>2.854 hours</td>
<td>0.509 hours</td>
<td>620</td>
</tr>
</tbody>
</table>
RESULTS

• All 7 STNA’s reported satisfaction with the activity detection accuracy

• Five participants states that the system resulted in changes in their body mechanics

• Six participants felt the system would be helpful when first learning good body mechanics

• Five participants felt that the vibrating watch helped them to know when they were using poor body mechanics during their bedside care

• All 5 participants were satisfied with the watch and did not feel it interfered with their work
FALL FRENZY

• One day event for PCNA’s and Nursing staff

• Annual competency day that included body mechanics

• Forty participants at the event

• Used the system to do common bedside tasks- pulling patient up in bed, lifting, getting up to a chair

• Real time feedback from the system plus direct observation from nursing education and the research team
RESULTS

• Thirty seven participants felt that the vibrating watch helped them know when they were using poor body mechanics

• Thirty five participants felt that the system would be helpful when first learning good body mechanics

• Thirty three did not mind having the Kinect camera record their body positions while practicing bedside care

• Thirty four participants like this way of learning compared to previous lecture/computer learning
LIMITATIONS

- Study was completed in one nursing long-term care facility
- There were only 7 participants in the pilot study
- Responder bias
- Cost


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