A Participatory Ergonomics Approach to Reducing Discomfort and Injuries among Custodial Workers

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Funding and support provided by State of Washington, Dept. of Labor & Industries, Safety & Health Investment Projects (SHIP)
UW WORKERS’ COMPENSATION COSTS
2009-2013

> UW FACILITIES SERVICES DEPT:

• 3rd HIGHEST COSTS FOLLOWING THE TWO MEDICAL CENTERS
## UW FACILITIES SERVICES TOP POSITIONS FOR TIME LOSS 2009-2013

<table>
<thead>
<tr>
<th>Facilities Services: Top 3 Positions</th>
<th>Time Loss Days</th>
<th>Time Loss $</th>
<th>% of Total $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custodian</td>
<td>5,520</td>
<td>$302,365</td>
<td>20%</td>
</tr>
<tr>
<td>Pipe/Steamfitter</td>
<td>2,244</td>
<td>$242,532</td>
<td>16%</td>
</tr>
<tr>
<td>Elevator Mechanic</td>
<td>1,532</td>
<td>$206,658</td>
<td>13%</td>
</tr>
<tr>
<td>Total for all Facilities</td>
<td>17,638</td>
<td>$1,538,000</td>
<td></td>
</tr>
<tr>
<td>Facilities: Top 3 Diagnoses</td>
<td>Time Loss Days</td>
<td>Time Loss $</td>
<td>% of Total $</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Sprain/Strain</td>
<td>10,014</td>
<td>$810,343</td>
<td>53%</td>
</tr>
<tr>
<td>Tendonitis</td>
<td>1,717</td>
<td>$221,374</td>
<td>14%</td>
</tr>
<tr>
<td>Contusion</td>
<td>2,133</td>
<td>$164,227</td>
<td>11%</td>
</tr>
<tr>
<td>Facilities: Top 3 Body Parts</td>
<td>Time Loss Days</td>
<td>Time Loss $</td>
<td>% of Total $</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Shoulder</td>
<td>5,199</td>
<td>$518,522</td>
<td>34%</td>
</tr>
<tr>
<td>Back</td>
<td>4,390</td>
<td>$387,322</td>
<td>25%</td>
</tr>
<tr>
<td>Knee(s)</td>
<td>1,174</td>
<td>$104,517</td>
<td>7%</td>
</tr>
</tbody>
</table>

Figure 2: *Compensable* claims for janitors (per 10,000 FTE) compared to other worker groups, 2003-2012

![Graph showing the rate of compensable claims for janitors compared to other worker groups from 2003 to 2012.](chart.png)

> 16th highest injury rate in the nation
> How speed-ups in work affected janitors’ health
> Workers reporting higher work intensity had two-fold increase in reported injury, disability and pain
> Back, arm and shoulder pain
> Conclusion: Increased workload is contributing to increased rates of injury, illness, musculoskeletal pain and work stress
OTHER FACTORS CONTRIBUTING TO CUSTODIANS’ INJURIES?

ERGONOMIC ISSUES IN CUSTODIAL WORK?
Assessed Potential for Collaboration and Feasibility

- UW EHS Leadership & Building Services Director & Safety Manager
- Supported by: UW Risk Management

- Safety & Health Investment Project (SHIP)
- Funded by the Washington State Department of Labor & Industries (L&I)

Participatory Ergonomics: Early Identification and Reduction of Risk

- IRB approval
- Met with Union at Joint Labor Management Meeting
ERGONOMICS:

FITTING THE WORK TO THE WORKER

“The applied science of fitting tools and tasks to the persons performing them in such a way that the strengths of the human body and psychology are maximized and exposure of weaknesses to stressors is minimized”.

---National Ag Safety Database
DESIREABLE ERGONOMIC CRITERIA

> Doesn’t decrease productivity
> Doesn’t decrease comfort, safety or health
> Doesn’t create new problems
> Doesn’t have an unworkable cost benefit ratio
> Doesn’t displace the worker
WMSD RISK FACTORS

> FORCE
> REPETITION
> MATERIAL HANDLING
> POSTURE
  > AWKWARD AND STATIC
BASIC ERGO PRINCIPLE--MAINTAIN NEUTRAL POSTURE

MUSCLES AT RESTING LENGTH AND JOINTS ARE NATURALLY ALIGNED → MAXIMUM CONTROL AND FORCE & MINIMUM STRESS
CLINICAL EXPERIENCE

Many custodians as patients:

> Often minority, immigrant, non-English fluency
> Typically long-term employment
> Aging population
> Take pride in their work
> Physical job
  > Musculoskeletal injuries
DISCOMFORT MAY BE AN EARLY INDICATION OF FUTURE INJURY

1. Clinical observation ([Piligian](#)) that a difference in sensibility [discomfort] is often the first indication of an evolving injury

2. Suggestion that peak and cumulative discomfort could predict future musculoskeletal pain ([Hamberg-vanReenen HH et al Ergonomics Vol 51 (5) 2008](#))

3. Baseline neck or shoulder discomfort predictive of future upper extremity tendonitis ([Werner et al 2005 (15) J Occ Rehab](#))
Participatory Ergonomics SHIP Project Phases

1. Developed a Pre-Modification Discomfort Survey of Tasks for Administration to Custodians

2. Used Survey Results to Direct Task Selection

3. Assembled Small Groups for ~4 Tasks

4. Training and Implementation

5. Post-Modification Survey

6. Pre and post Risk Assessments
PHASE 1: Task Discomfort Pictorial Survey Development

> DEMOGRAPHICS (NOT TOO IDENTIFIABLE)

> MAJOR TASKS PHOTOGRAPHED TASKS IN SEQUENCE

> ASKED IF THE TASK CAUSED DISCOMFORT

> IF YES, BODY DIAGRAM AND PICTORIAL LIKERT-LIKE SCALE
ADMINISTERING THE SURVEY

- Consent documents in multiple languages, interpreters present; voluntary and anonymous.
- Facilities head and supervisor left after intro.
- Demonstrated with examples how to take the survey.
- 11 locations including makeup sessions.
Pre-Modification Survey Results

133 custodians took the survey
(60% response rate)
- 76 females, 47 males
- Feel most relaxed listening to English = 58%
- Feel most relaxed listening to another language = 35%
- 113 right-handed, 7 left-handed
PHASE 1: Pre-Modification Survey Results

Age (years)

- 20-29: 1%
- 30-39: 3%
- 40-49: 20%
- 50-59: 35%
- 60-69: 25%
- 70-79: 5%
- No answer: 0%

*percentage*
PHASE 1: Pre-Modification Survey Results

Height Breakdown

- Under 5'0"
- 5'0" to 5'5"
- 5'6" to 5'10"
- 5'11" and up
Pre-Modification Survey Results

Years at Job

- Under 2
- 2 to 10
- 11 to 20
- Over 21
- No answer

Percent
Pre-Modification Survey Results

BODY AREAS MOST AFFECTED

BACK
SHOULDERS
KNEES
PROJECT PHASES

1. Developed a Pre-Intervention Discomfort Survey of 16 Tasks for Administration to Custodians

2. Used Survey Results to Direct Task Selection

3. Assembled Small Groups for ~4 Tasks

4. Implementation and Intervention Training

5. Post-Intervention Survey

6. Pre and post Risk Assessments
Reported by custodians to cause the most discomfort

- Vacuum Backpack
- Picking up trash from floor
- Picking up and dumping garbage
- Wiping Surfaces
- Scraping Floors
- Cleaning Toilets
Participatory Ergonomics Project Phases

> 1. Developed a Pre-Intervention Discomfort Survey of 16 Tasks for Administration to Custodians
> 2. Used Survey Results to Direct Task Selection
> 3. Assembled Small Groups for Each of the ~4 Tasks
> 4. Implementation and Intervention Training
> 5. Post-Intervention Survey
SMALL GROUPS FOR TASKS

> STILL VOLUNTARY
> NOT ANONYMOUS
> COMPRISED OF CUSTODIANS WHO COMPLAINED OF DISCOMFORT AND THOSE WITHOUT DISCOMFORT
> 4 CUSTODIANS, SUPERVISOR (AND BACKUP), ERGONOMIST, PROJECT MANAGER, OCC DOC AND SOME WITH SAFETY IH
> FROM DIFFERENT AREAS OF UW CAMPUS
> ANTICIPATED 4-5 SESSIONS
SMALL GROUPS FOR EACH TASK

- BEGAN WITH PROJECT INFO, CONSENT, AND ERGO TALK
- DISCUSSION
- OBSERVATION, PHOTOS, VIDEOS OF CUSTODIANS PERFORMING TASK
TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)
TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)
# Using the Vacuum Backpack (& Harness)

<table>
<thead>
<tr>
<th>Model</th>
<th>Age</th>
<th>Weight</th>
<th>Size</th>
<th>Power</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Coach - Corded (Largest)</td>
<td>5</td>
<td>14 lbs</td>
<td>29.5”</td>
<td>1</td>
<td>down</td>
</tr>
<tr>
<td>Quarter Pack - Corded (Medium)</td>
<td>4</td>
<td>12 lbs</td>
<td>21.5”</td>
<td>3</td>
<td>down</td>
</tr>
<tr>
<td>Pro Co - Corded (Smallest)</td>
<td>1</td>
<td>13 lbs</td>
<td>18.5”</td>
<td>2</td>
<td>rear</td>
</tr>
<tr>
<td>Cordless - Go Free Pro Battery</td>
<td></td>
<td>19.5 lbs</td>
<td>24”</td>
<td>4</td>
<td>rear</td>
</tr>
<tr>
<td>Nacecare (Battery)</td>
<td></td>
<td>16 lbs</td>
<td>17%</td>
<td>5</td>
<td>rear</td>
</tr>
</tbody>
</table>

- **Suction**: 1-5 power rating (1 in > power)
- **Age**: 1-5 1 = Newest, 5 = Oldest
- **Opinion (Suction)**: 1-5, 1 = Down, 5 = Down
- **Battery Life**
USING THE VACUUM BACKPACK (& ITS HARNESS)
TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)
PHASE 3: SAMPLE DISCUSSION FOLLOWING USE OF NEW TOOL OR METHOD

> DID YOU USE IT?
> DID IT CAUSE LESS DISCOMFORT? WHERE?
> DID IT CAUSE NEW DISCOMFORT? WHERE?
> STORAGE OR TRANSPORT?
> WOULD YOU USE THIS?
VACUUM BACKPACK COMPLEXITY---TRAINING NEEDS UNDERESTIMATED
VACUUM BACKPACK & HARNESS USE TRAINING SESSIONS

> BROUGHT MANUFACTURER REPS, ERGO, FACILITIES SAFETY, SUPERVISORS ---plus intro by director Building Services

> IN MULTIPLE GROUP SESSIONS (15-40), DEMONSTRATED ADJUSTABILITY OF VACUUM BACKPACK & FIT CUSTODIANS TO OPTIMAL

  - VACUUM BACKPACK FIT---TRUNK  (HARNESS + VAC SIZE)
  - WEIGHT ON HIPS

> DEMONSTRATED AND ALLOWED EACH CUSTODIAN TO DEMONSTRATE PROPER HARNESS WEAR;

> MISC: CLIPS, VB STORAGE, OTHER ESSENTIALS (POWER, BAGS, WEIGHT, WAND USE, TOOL)
192 custodians (115 women and 77 men) participated

**BOLT PLACEMENT PREFERENCES:**

<table>
<thead>
<tr>
<th>WOMEN</th>
<th>MEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>18% of women preferred HI</td>
<td>61% of men preferred HI</td>
</tr>
<tr>
<td>57% of women preferred MID</td>
<td>26% of men preferred MID</td>
</tr>
<tr>
<td>19% of women preferred LOW</td>
<td>5% of men preferred LOW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Height Range</th>
<th>WOMEN</th>
<th>MEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custodians under 5’</td>
<td>(none preferred HI)</td>
<td>(none preferred HI)</td>
</tr>
<tr>
<td>(none preferred HI)</td>
<td>50% preferred MID</td>
<td>50% preferred MID</td>
</tr>
<tr>
<td>50% preferred LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custodians 5’0” to 5’5”</td>
<td>20% preferred HI</td>
<td>67% preferred HI</td>
</tr>
<tr>
<td>20% preferred HI</td>
<td>61% preferred MID</td>
<td>25% preferred MID</td>
</tr>
<tr>
<td>61% preferred MID</td>
<td>14% preferred LOW</td>
<td>6% preferred LOW</td>
</tr>
<tr>
<td>14% preferred LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custodians 5’6” to 5’10”</td>
<td>67% preferred HI</td>
<td>73% preferred HI</td>
</tr>
<tr>
<td>67% preferred HI</td>
<td>25% preferred MID</td>
<td>20% preferred MID</td>
</tr>
<tr>
<td>25% preferred MID</td>
<td>6% preferred LOW</td>
<td>(none preferred LOW)</td>
</tr>
<tr>
<td>6% preferred LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custodians 5’11”+</td>
<td>73% preferred HI</td>
<td></td>
</tr>
<tr>
<td>73% preferred HI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(none preferred MID)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(none preferred LOW)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vacuum Backpack Storage
TASK 2: SCRAPING FLOORS
SCRAPING FLOORS

“THIS WILL SAVE OUR BACKS”
TASK 3: CLEANING TOILETS
TASK 3: CLEANING TOILETS

TRADITIONAL TOILET BRUSH
TASK 3: CLEANING TOILETS
LONGER HANDLED BRUSH
CLEANING TOILET WITH LONG-HANDED LED BRUSH
Comparison of traditional and long handled toilet brushes
TASK 3:
CLEANING TOILETS
TASK 3:
CLEANING TOILETS
Magnetic door holder
TASK 4: PICKING UP TRASH FROM THE FLOOR
TASK 4: PICKING UP TRASH FROM THE FLOOR
TASK 4: PICKING UP TRASH FROM THE FLOOR
TASK 5: DUMPING TRASH INTO DUMPSTER
BACKGROUND:
Custodians' injuries are the third leading cause of work-related compensation claims and costs at the University of Washington (UW). The work of custodians is often physically demanding, repetitive and may be performed in awkward positions, all of which are risks for musculoskeletal injury. Studies suggest early musculoskeletal discomfort may predict future injury.

OBJECTIVE:
During the 15-month study period through May 2016, the project seeks to assess and then decrease the reported level of discomfort among UW custodians by identifying tasks that cause a higher level of discomfort and using a participatory approach to identify, test and implement ergonomic solutions. The project is participatory in nature and involves custodians, managers, ergonomists, occupational health, medical and environmental health and safety personnel working together to identify and change work activities that may cause future injuries.

CONSIDERATIONS:
 Physical job with aging workforce
 Receptive/collaborative/progressive leadership (award-winning and practicing LEAN)
 Unionized
 Previous work in department by DEOHS
 Safety & Health Investment Projects (SHIP) Grant - availability of funds

SPONSORSHIP:
Funding and support for this project has been provided by the State of Washington, Department of Labor & Industries, Safety & Health Investment Projects (SHIP).

TASK: DUMPING TRASH INTO DUMPSTER (POLE)
DUMPING TRASH INTO DUMPSTER

Using the Dumpster Pole
DUMPING TRASH INTO DUMPSTER

Using the Dumpster Prop
DUMPING TRASH INTO DUMPSTER

Using the Dumpster Prop
PROJECT PHASES

1. Developed a Pre-Modification Discomfort Survey of 16 Tasks for Administration to Custodians

2. Used Survey Results to Direct Task Selection

3. Assembled Small Groups for ~4 Tasks

4. Training and Implementation for Tasks

5. Post-Modification Survey

6. Pre and post Risk Assessments
PROJECT PHASES

1. Developed a Pre-Modification Discomfort Survey of 16 Tasks for Administration to Custodians

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6. Pre and post Risk Assessments
# Demographic Characteristics of Custodial Workers (Pre-Survey n=133, Post-Survey n=106)

## Pre-Modification Survey (n=133) vs. Post-Modification Survey (n=106)

<table>
<thead>
<tr>
<th></th>
<th>Pre-Modification Survey</th>
<th>Post-Modification Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 years</td>
<td>10 (8)</td>
<td>9 (9)</td>
</tr>
<tr>
<td>40-49 years</td>
<td>29 (23)</td>
<td>21 (22)</td>
</tr>
<tr>
<td>50-59 years</td>
<td>51 (40)</td>
<td>42 (43)</td>
</tr>
<tr>
<td>60+ years</td>
<td>37 (29)</td>
<td>25 (26)</td>
</tr>
<tr>
<td>Missing</td>
<td>6 --</td>
<td>9 --</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76 (62)</td>
<td>55 (58)</td>
</tr>
<tr>
<td>Male</td>
<td>47 (38)</td>
<td>40 (42)</td>
</tr>
<tr>
<td>Missing</td>
<td>10 --</td>
<td>11 --</td>
</tr>
<tr>
<td><strong>Years Worked at Current Job</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 years</td>
<td>26 (21)</td>
<td>27 (28)</td>
</tr>
<tr>
<td>6-10 years</td>
<td>24 (19)</td>
<td>18 (19)</td>
</tr>
<tr>
<td>11-15 years</td>
<td>26 (21)</td>
<td>19 (20)</td>
</tr>
<tr>
<td>16-20 years</td>
<td>29 (23)</td>
<td>15 (15)</td>
</tr>
<tr>
<td>21+ years</td>
<td>20 (16)</td>
<td>17 (18)</td>
</tr>
<tr>
<td>Missing</td>
<td>8 --</td>
<td>10 --</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (&lt;18.5)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Normal (18.5-25)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Overweight (25-30)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Obese (30+)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Missing</td>
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</tbody>
</table>

## Post-Modification Survey (n=106)

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Height</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 5'5 M/5'0 F</td>
<td>27 (27)</td>
<td>29 (37)</td>
</tr>
<tr>
<td>5'6-5'8 M/5'1-5'2 F</td>
<td>38 (39)</td>
<td>23 (30)</td>
</tr>
<tr>
<td>Tall (≥ 5'9 M/5'3 F)</td>
<td>33 (34)</td>
<td>26 (33)</td>
</tr>
<tr>
<td>Missing</td>
<td>35 --</td>
<td>28 --</td>
</tr>
<tr>
<td><strong>Primary Language</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>77 (62)</td>
<td>60 (66)</td>
</tr>
<tr>
<td>Other</td>
<td>48 (38)</td>
<td>31 (34)</td>
</tr>
<tr>
<td>Missing</td>
<td>8 --</td>
<td>15 --</td>
</tr>
<tr>
<td><strong>Primary Handedness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>113 (90)</td>
<td>79 (89)</td>
</tr>
<tr>
<td>Left/Both</td>
<td>13 (10)</td>
<td>10 (11)</td>
</tr>
<tr>
<td>Missing</td>
<td>7 --</td>
<td>17 --</td>
</tr>
<tr>
<td><strong>Attended Training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>--</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Some Trainings</td>
<td>--</td>
<td>36 (35)</td>
</tr>
<tr>
<td>All Trainings</td>
<td>--</td>
<td>66 (63)</td>
</tr>
<tr>
<td>Missing</td>
<td>--</td>
<td>2 --</td>
</tr>
<tr>
<td><strong>Taken Survey Before</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>125 (96)</td>
<td>33 (33)</td>
</tr>
<tr>
<td>Yes</td>
<td>5 (4)</td>
<td>68 (67)</td>
</tr>
<tr>
<td>Missing</td>
<td>3 --</td>
<td>5 --</td>
</tr>
</tbody>
</table>
Training Participation and Receipt of Modified Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>UW Custodians (n = 218)</th>
<th>Study Participants (n=106)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>Vacuum Backpack</td>
<td>189 (86)</td>
<td>96 (95)</td>
</tr>
<tr>
<td>Cleaning Toilets</td>
<td>185 (85)</td>
<td>93 (91)</td>
</tr>
<tr>
<td>Picking Up Garbage from Floor</td>
<td>185 (85)</td>
<td>83 (86)</td>
</tr>
<tr>
<td>Scraping Floor</td>
<td>185 (85)</td>
<td>97 (88)</td>
</tr>
</tbody>
</table>

**Attended Training**

<table>
<thead>
<tr>
<th>Attended Training</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>96</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(95)</td>
<td>(5)</td>
<td>--</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Received New Tool</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58</td>
<td>10</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>(85)</td>
<td>(15)</td>
<td>--</td>
</tr>
</tbody>
</table>

**Received New Tool**

<table>
<thead>
<tr>
<th>Received New Tool</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>(90)</td>
<td>(10)</td>
<td>--</td>
</tr>
</tbody>
</table>

**Picking Up Garbage from Floor**

<table>
<thead>
<tr>
<th>Picking Up Garbage from Floor</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>51</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>(25)</td>
<td>(75)</td>
<td>--</td>
</tr>
</tbody>
</table>

**Scraping Floor**

<table>
<thead>
<tr>
<th>Scraping Floor</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
<td>51</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>(15)</td>
<td>(85)</td>
<td>--</td>
</tr>
</tbody>
</table>
DID WE REDUCE DISCOMFORT?
High Discomfort Pre- and Post-Modification Among All Surveyed Participants

**Modification:** Long-handled toilet brush reduces trunk flexion

**Modification:** Long-handled trash grabber reduces crouching or flexion

**Vacuum Backpack:** Training and Fit

---

**Vacuum Backpack Pre-Mod. (n=106)**

**Vacuum Backpack Post-Mod. (n=106)**

**Scraping Floor Pre-Modification (n=133)**

**Scraping Floor Post-Modification (n=106)**

**Picking Up Garbage/Floor Pre-Mod. (n=133)**

**Picking Up Garbage/Floor Post-Mod. (n=106)**

**Cleaning Toilets Pre-Modification (n=133)**

**Cleaning Toilets Post-Modification (n=106)**

- Back
- Shoulders
- Arms/Elbows
- Wrist/Hands
- Knees
- Other
- Total
Total High Discomfort of All Surveyed for Unmodified Tasks Pre-Modification and Post-Modification

- Pre-Modification (n=133)
- Post-Modification (n=106)
Modification:
Systematically tightening harness straps personalizes backpack fit

Modification: Long handled toilet brush reduces bending over

Modification: Long trash grabber reduces picking up trash by hand

Modification: Long-handled scraper reduces kneeling and bending
Percentage of Participants Reporting High Discomfort Among Those Reporting Any Level of Discomfort for Unmodified Tasks*
PROJECT PHASES

1. Developed a Pre-Intervention Discomfort Survey of 16 Tasks for Administration to Custodians

2. Used Survey Results to Direct Task Selection

3. Assembled Small Groups for ~4 Tasks

4. Training and Implementation for Tasks

5. Post-Modification Survey

6. Pre and post Risk Assessments
RAPID ENTIRE BODY ASSESSMENT TOOL (REBA, Ergonomics Plus)
Task Information

Analyst: Steve Davis
Job Name: EW Long-Handled Toilet Brush
Workstation ID: UW Custodial Grant 2016

REBA Score

Hand
- Right Side
- Left Side

Wrist
- < -15: Neutral
- > 15: Side Bent or Twist

Neck
- < -20: Neck is twisting or side bending

Upper Arms
- < -20: Shoulder is raised
- -20 to 20: Upper arm is abducted
- 21 to 45: Arm is supported
- 46 to 90: Arm not supported
- > 90: Arm is supported

Leg
- Stable
- Unstable
- 30 to 60: Unstable
- > 60: Unstable

Lower Arms
- 0 to 60: Grip
- 60 to 100: Grip
- > 100: Grip

Trunk
- < -20: Trunk is twisting or side bending
- -20 to 0: Trunk between 21 and 60 deg. (Flexion)
- > 0: Trunk is twisting or side bending

Coupling/Grip
- Good
- Fair
- Poor
- Unacceptable

Force or Load
- Shock/rapid build up of force
- Repeated more than 4 times/min

Muscle Use
- Static, e.g., held for longer than 1 min
- Rapid large posture change or unstable base
Rapid Entire Body Assessment (REBA) SCORING (Ergonomics Plus)

<table>
<thead>
<tr>
<th>Score</th>
<th>Level of MSD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>negligible risk, no action required</td>
</tr>
<tr>
<td>2-3</td>
<td>low risk, change may be needed</td>
</tr>
<tr>
<td>4-7</td>
<td>medium risk, further investigation, change soon</td>
</tr>
<tr>
<td>8-10</td>
<td>high risk, investigate and implement change</td>
</tr>
<tr>
<td>11+</td>
<td>very high risk, implement change</td>
</tr>
</tbody>
</table>
# RAPID ENTIRE BODY ASSESSMENTS

<table>
<thead>
<tr>
<th>TASK/Tool</th>
<th>REBA PRE-MOD</th>
<th>REBA POST-MOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCRAPER</td>
<td>10 (High Risk)</td>
<td>3 (Low Risk)</td>
</tr>
<tr>
<td>TOILET</td>
<td>7 (Medium Risk)</td>
<td>1-2 (Low Risk)</td>
</tr>
<tr>
<td>GRABBER</td>
<td>8-10 (High Risk)</td>
<td>3-4 (Low Medium Risk)</td>
</tr>
<tr>
<td>VACBAC*</td>
<td>4 (Medium)</td>
<td>3 (Low Risk)</td>
</tr>
</tbody>
</table>

*REBA doesn’t fully account for static load
CONTROLLING OCCUPATIONAL EXPOSURES (NIOSH)

Hierarchy of Controls

1. Elimination
   - Physically remove the hazard
2. Substitution
   - Replace the hazard
3. Engineering Controls
   - Isolate people from the hazard
4. Administrative Controls
   - Change the way people work
5. PPE
   - Protect the worker with Personal Protective Equipment
Summary

- Custodians participated together with managers, supervisors, & health and safety professionals to address ergonomic aspects of their work.

- Consistent with WC data

- Tasks where tools and training were received appeared to show greatest reductions in survey of discomfort.

- REBAS were reduced in tasks that were modified.

- Supervisors need the same training as custodians.

- Role for Occupational Medicine in Injury Prevention.
Despite limitations, our survey method provided useful information:

- Identified tasks workers reported as causing high discomfort
- Suggested training and modified tools were beneficial
- Revealed potential language barriers that could be relevant for health and safety
- Was useful in identifying where post modification attention was needed
  > The shorter survey tool identified the specifics
Challenges

- Lack of availability or quantity of “ergo” tools
- Lack of adjustability or variety in tools
- Variability in supervisor engagement or knowledge regarding ergonomic aspects
  - Unequal distribution or assessment of need
- Issues beyond ergonomic
LIMITATIONS

> Anonymous Survey
> No Control Group
> Participants self-selected. No health exclusions.
  • (biased toward pain?)
> Survey design
  • Multiple responses to questions that asked for one body part
  • Conflicting answers
    > % completed correctly
> Small group activities became limited by the workload
> Time frame was brief
> Different time of year for surveys
> Different messaging for survey participation
WHAT DID WE LEARN (OR NEED TO BE REMINDED OF)?

> TASKS WERE MORE COMPLEX THAN IS APPARENT
  • WORKER INPUT, OBSERVATIONS, PARTICIPATION IS ESSENTIAL

> CHANGE IS A PROCESS
  • PLANNING AND FOLLOW UP ARE ESSENTIAL

> HAVING THE WORKER DEMONSTRATE NEWLY LEARNED INFORMATION
  • Almost no one learned by watching!

> OBSERVING THE WORKER PERFORMING THE TASK BEFORE AND AFTER INTERVENTION
  > CAUTION NOT TO INTRODUCE NEW MSD PROBLEMS

> SUPERVISORS NEED THE SAME TRAINING
  • REINFORCEMENT OF NEW INFORMATION IS ESSENTIAL
WHAT DID WE LEARN (OR NEED TO BE REMINDED OF)

> HEALTH AND SAFETY CULTURE IS ESSENTIAL TO SUCCESS
> OUR FINDINGS WERE NOT UNIQUE TO UW CUSTODIAL WORK
> MOST OF INTERVENTIONS NOT COSTLY
> LOOK AT RESOURCES:
  - A LOT OF TALENT--- CUSTODIANS, SUPERVISORS, SAFETY, VENDORS, UW MECHANICAL ENGINEERING CLASS, HIPRC
OFFSHOOTS OF THE PROJECT

> FACILITIES IS LOOKING AT MACHINE ASSISTANCE FOR HEAVIER WORK (SCRUBBERS, DUMPERS) AND MORE ATTENTION TO EVOLVING METHODS

> CONNECTIONS MADE TO IMMIGRANT WORK PROGRAM ORGANIZATION TO TRAIN THEM FOR POSITION OF UW CUSTODIAN TO FILL STAFF VACANCIES

> FACILITIES IS CONTEMPLATING A NEW POSITION TO CARRY THE WORK FORWARD
THANKS TO THE PROJECT TEAM:

- Karen Crow (EHS)
- Mike Nguyen (Facilities)
- Rebecca Tesfamarian (Facilities, WFSE)
- Steve Davis & Terry Graham (Performance Ergonomics)
- Gene Woodard & Tracey Mosier (Facilities)
- Sheryl Schwartz & Suzanne Mason (EHS); former EHS, Ed Havey
- Vivian Lyons (HIPRC) and Allyson O’Connor (HIPRC, DEOHS)

**Amazing Contributors:**

- THE FACILITIES CUSTODIANS and
- Mark Hash and Dean Seaman
- Chris Pennington and Barbara Brown (UW FACilities Health & Safety)
- Chris and Jacalyn from ProTeam
- Aaron, Mark D., Scott, Sattia, Christine, Zerome, John, Crystal, Rosanda
- and UW Mechanical Engineering Students
THANKS TO L&I FOR FUNDING OUR SHIP GRANT
INSTRUCTIONS

1. Ensure that it is clear.
2. Communication with the rescue team.
3. Operate the WINCH again and confirm launch of the life raft.
4. Lashings at the launch rack.
5. Release the raft when the IBA deployment is complete.

LIFE RAFT
DEPLOYMENT STATION

RAFTS CONTAIN CAPACITY FOR 20 TENDERS.

DO NOT TOUCH
SAFETY EQUIPMENT IS NOT FOR PUBLIC USE.