A Participatory Ergonomics Pilot Project toward Reducing Discomfort and Injury Risk among Custodial Workers

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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

Facilities Services: Top 3 Positions	Time Loss Days	Time Loss $	% of Total $
Custodian	5,520	$302,365	20%
Pipe/Steamfitter	2,244	$242,532	16%
Elevator Mechanic	1,532	$206,658	13%
Total for all Facilities	17,638	$1,538,000	

UW FACILITIES SERVICES TOP DIAGNOSES FOR TIME LOSS 2009-2013

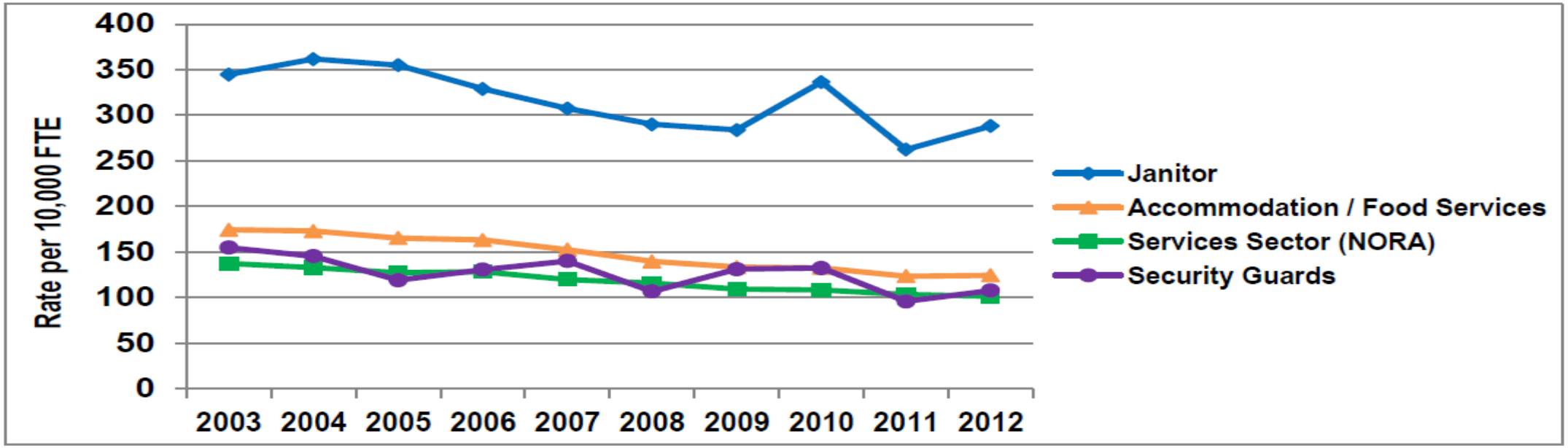
Facilities: Top 3 Diagnoses	Time Loss Days	Time Loss $	% of Total $
Sprain/Strain	10,014	$810,343	53%
Tendonitis	1,717	$221,374	14%
Contusion	2,133	$164,227	11%

UW FACILITIES SERVICES TOP BODY REGION INJURED 2009-2013

Facilities: Top 3 Body Parts	Time Loss Days	Time Loss $	% of Total $
Shoulder	5,199	$518,522	34%
Back	4,390	$387,322	25%
Knee(s)	1,174	$104,517	7%

2014 L&I Report to WA State Rep. Reykdal & Sells

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



UW DEOHS: Seixas, Simcox, Dominguez: Workload & Health and Safety Study of Commercial Janitors 2013

- 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?**

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

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 (MSD)**

WMSD RISK FACTORS

- FORCE
- REPETITION
- MATERIAL HANDLING
- POSTURE
  - AWKWARD AND STATIC

Injury Continuum ((D. Darren McDonald --Regulatory Craft Conference 2007 WCBNS)

DISCOMFORT MAY BE AN EARLY INDICATION OF FUTURE INJURY

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

2. Baseline neck or shoulder discomfort predictive of future upper extremity tendonitis *(Werner et al 2005 (15) J Occ Rehab)*

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

Assessed Potential for Collaboration and Feasibility---VITAL Leadership Support

- 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

What is Participatory Ergonomics?

- **Participatory Ergonomics** is an employee driven approach focused to ensure good design, comfort, safety and health. (D. Darren McDonald --Regulatory Craft Conference 2007 WCBNS)

What is Participatory Ergonomics?

- "the involvement of people in planning and controlling a significant amount of their own work activities,
- with sufficient knowledge and power to influence both processes and outcomes in order to achieve desirable goals."

(D. Darren McDonald --
Regulatory Craft Conference 2007 WCBNS)

And leadership commitment

Participatory Ergonomics SHIP Project Phases

1. Developed a Pre-Modification **Discomfort Questionnaire** of Tasks to Survey of Custodians
2. Used Survey Results to Direct **Task Selection**
3. **Small Groups** for Task Analysis and Modifications
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

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ADMINISTERING THE SURVEY

VOLUNTARY AND ANONYMOUS

- CONSENT DOCUMENTS IN MULTIPLE LANGUAGES, INTERPRETERS PRESENT; FACILITIES HEAD AND SUPERVISOR LEFT AFTER INTRO
- DEMONSTRATED WITH EXAMPLES HOW TO TAKE THE SURVEY
- 11 LOCATIONS INCLUDING MAKEUP SESSIONS

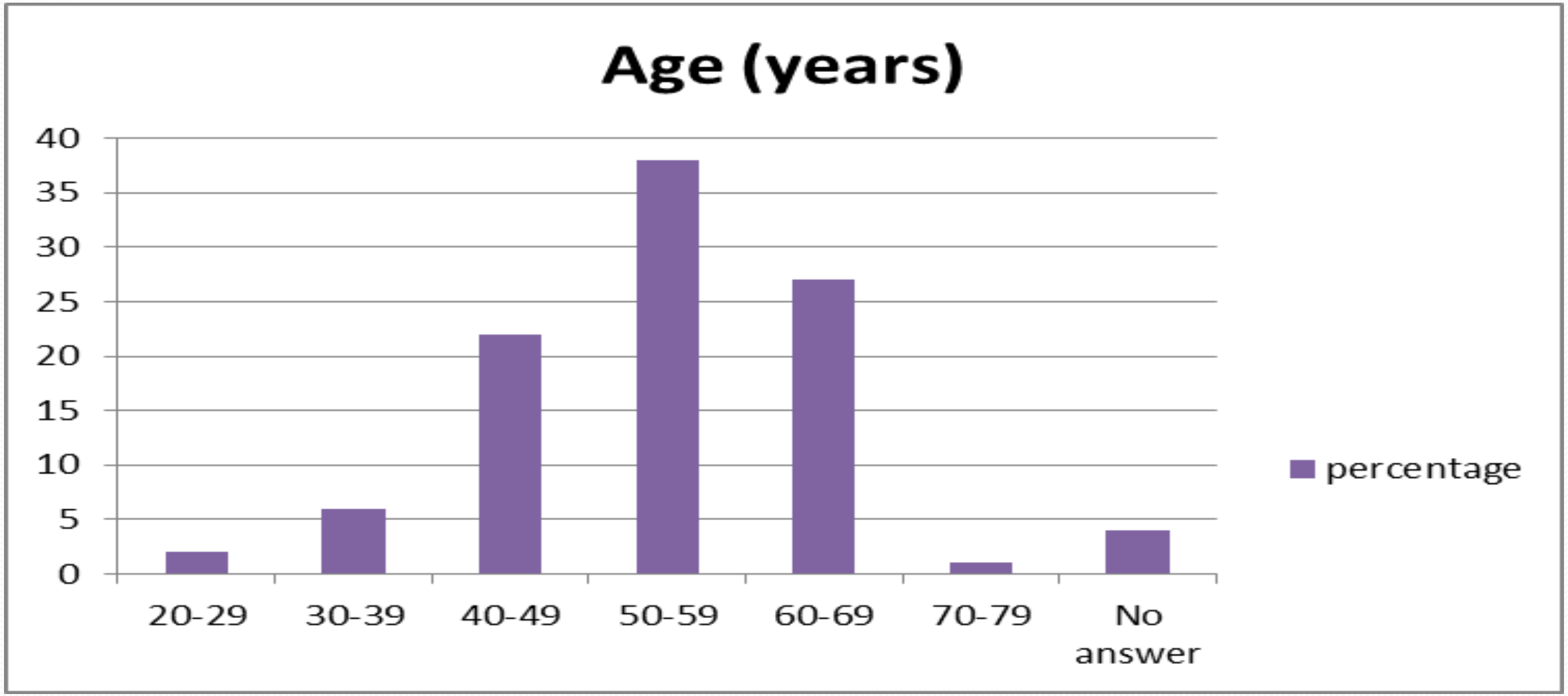
Pre-Modification Survey Results

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



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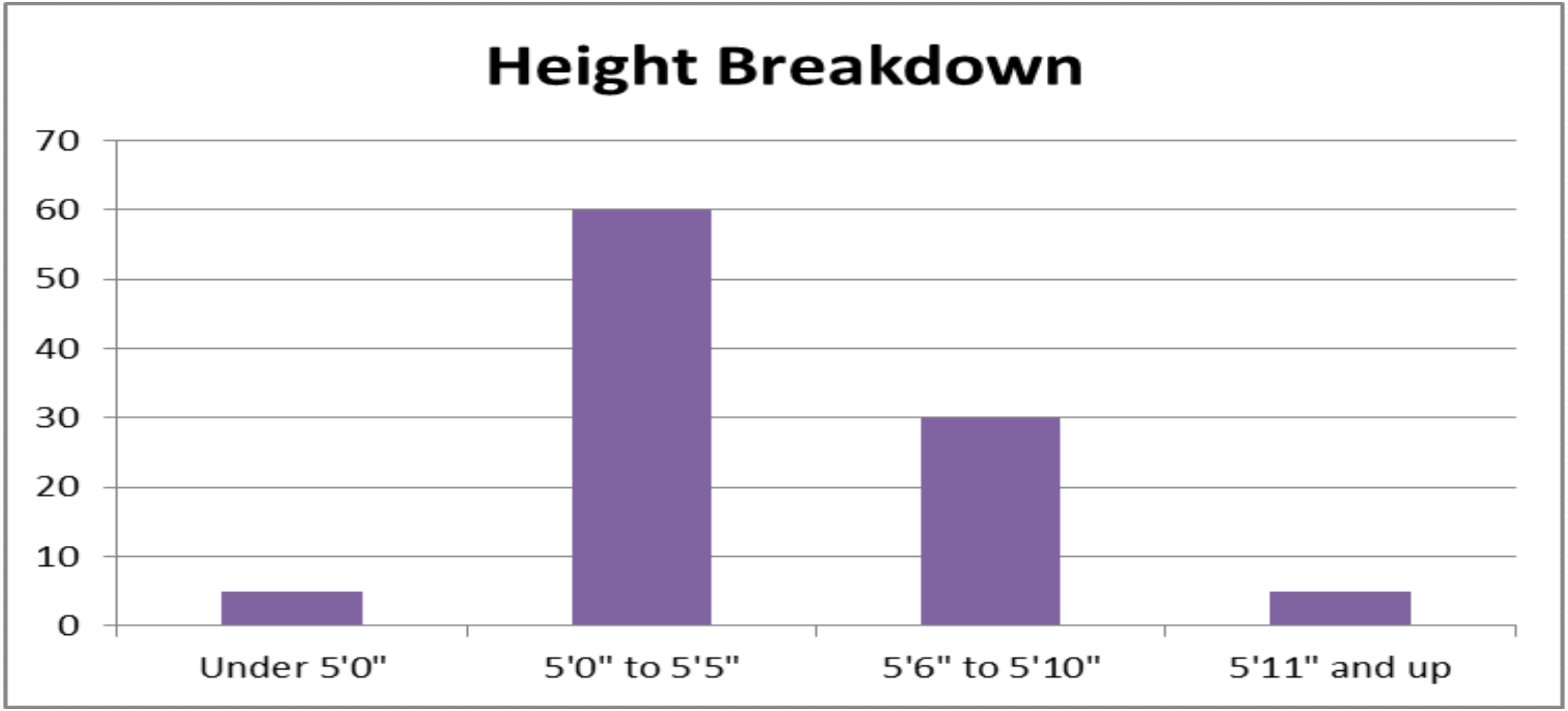
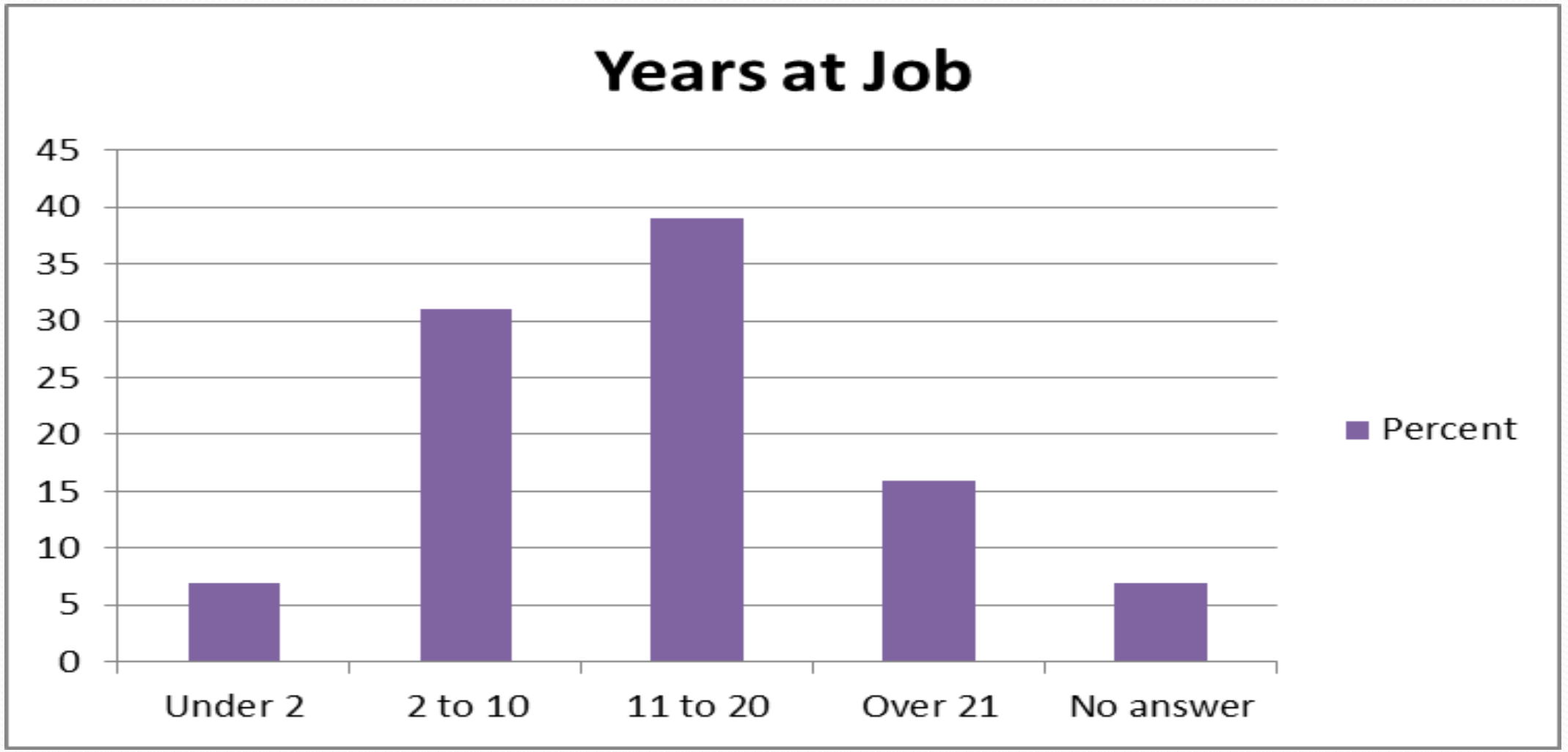


Pre-Modification Survey Results



Pre-Modification Survey Results

BODY AREAS MOST AFFECTED

BACK

SHOULDERS

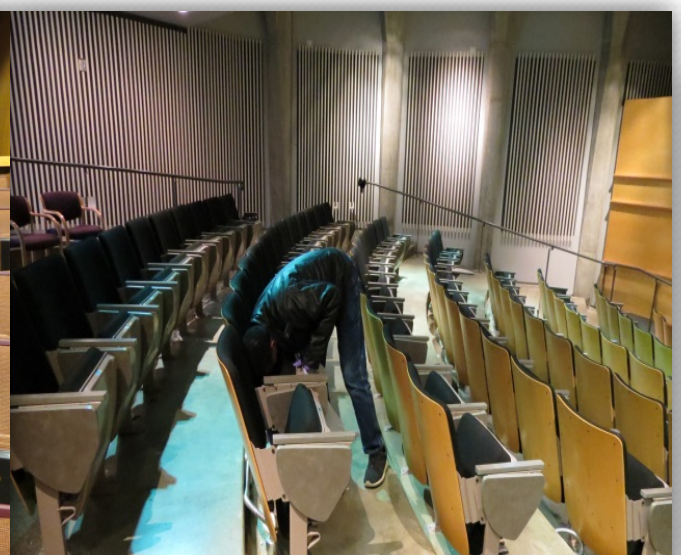
KNEES

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 TOP 4 TASKS

- STILL VOLUNTARY
- NOT ANONYMOUS
- COMPRISED OF CUSTODIANS WHO REPORTED 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

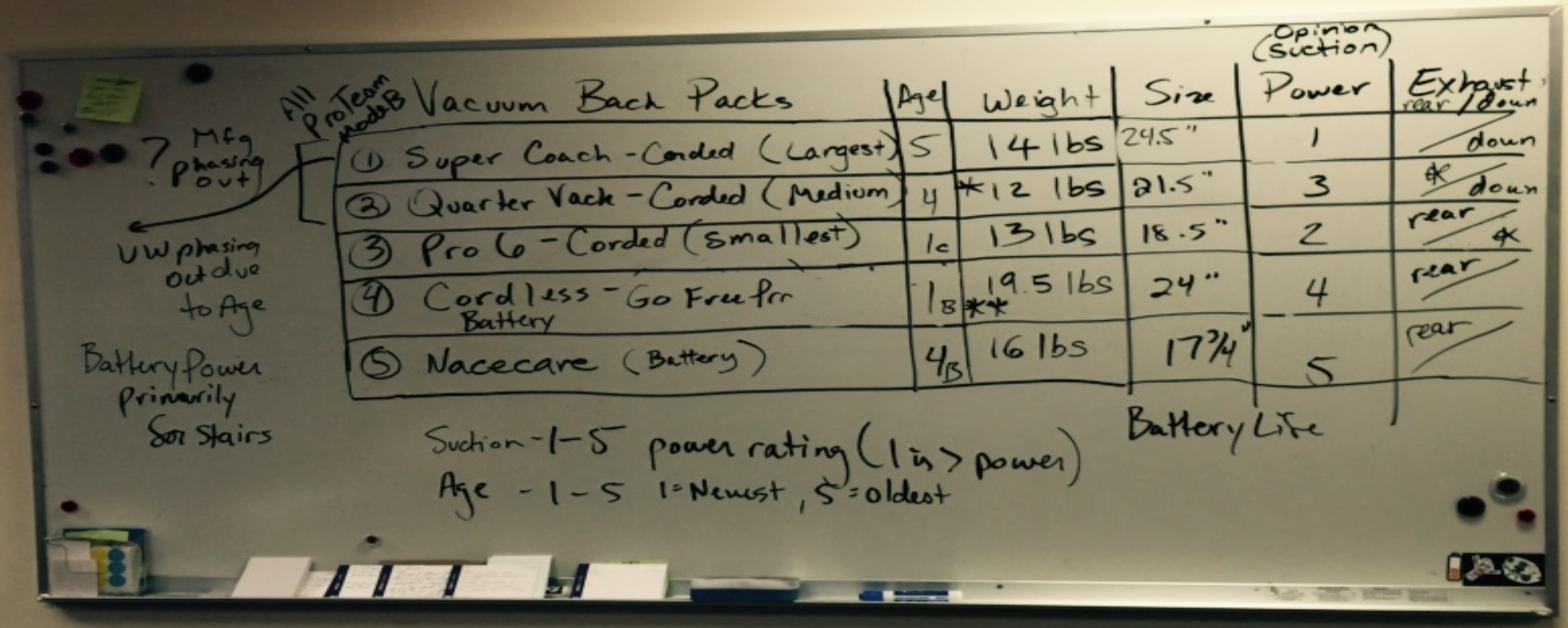
SMALL GROUPS FOR EACH TASK

- **BEGAN WITH PROJECT INFO, CONSENT, AND ERGO TALK**
- **DISCUSSION**
- **OBSERVATION, PHOTOS, VIDEOS OF CUSTODIANS PERFORMING TASK**

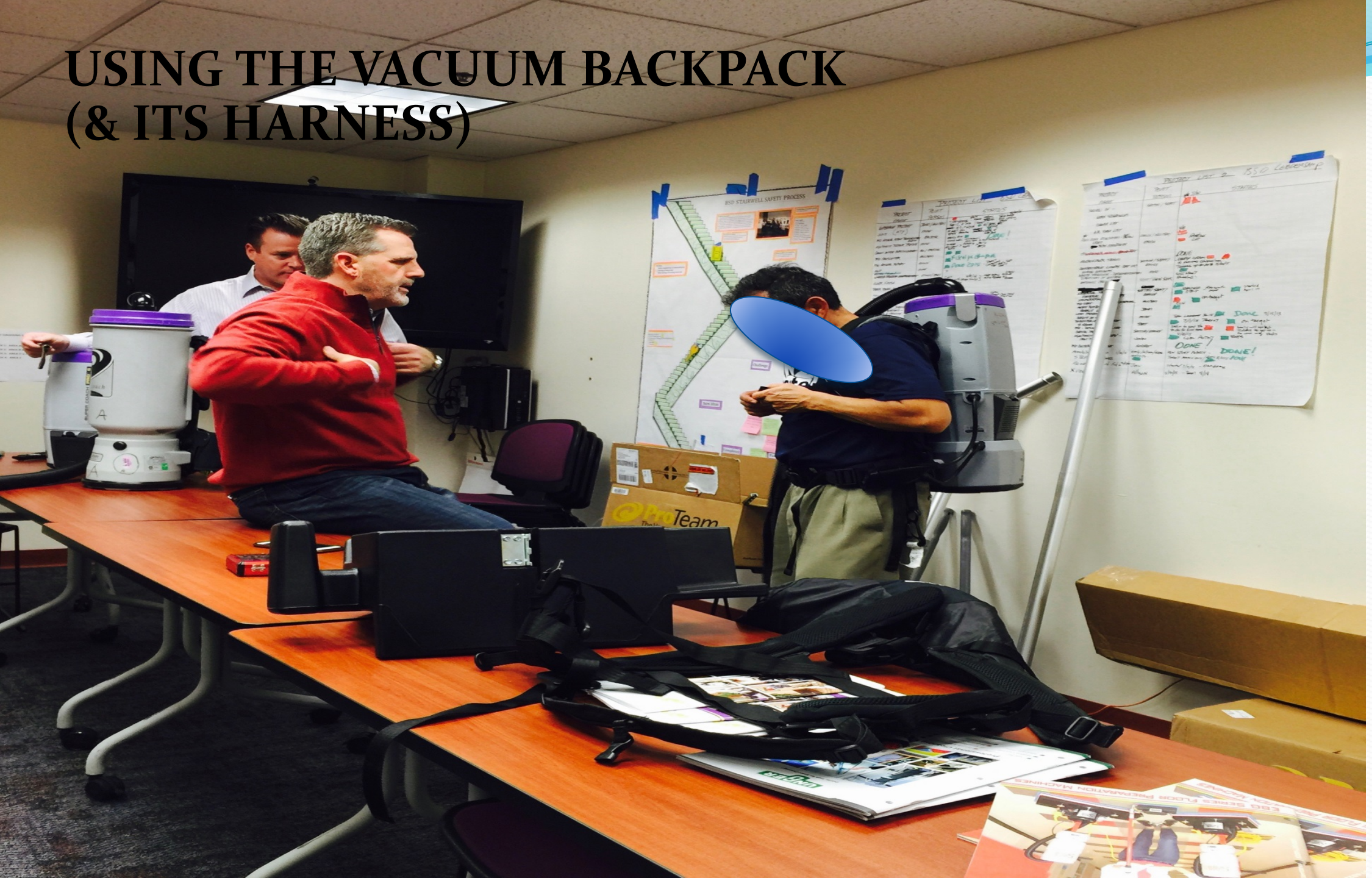
TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)

TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)

USING THE VACUUM BACKPACK (& HARNESS)



USING THE VACUUM BACKPACK (& ITS HARNESS)



TASK 1: USING THE VACUUM BACKPACK (& ITS HARNESS)


FY16 Q2
NOV 19
NOV 26
DEC 3
DEC 10
DEC 17
QA
AIP
Batteries
Breeze
Perf Eval
NEW IDEAS

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?
- BETTER, NOT AS GOOD OR SAME AS PREVIOUS?
- STOREAGE 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)**

VACUUM BACKPACK TRAINING RESULTS

192 custodians (115 women and 77 men) participated

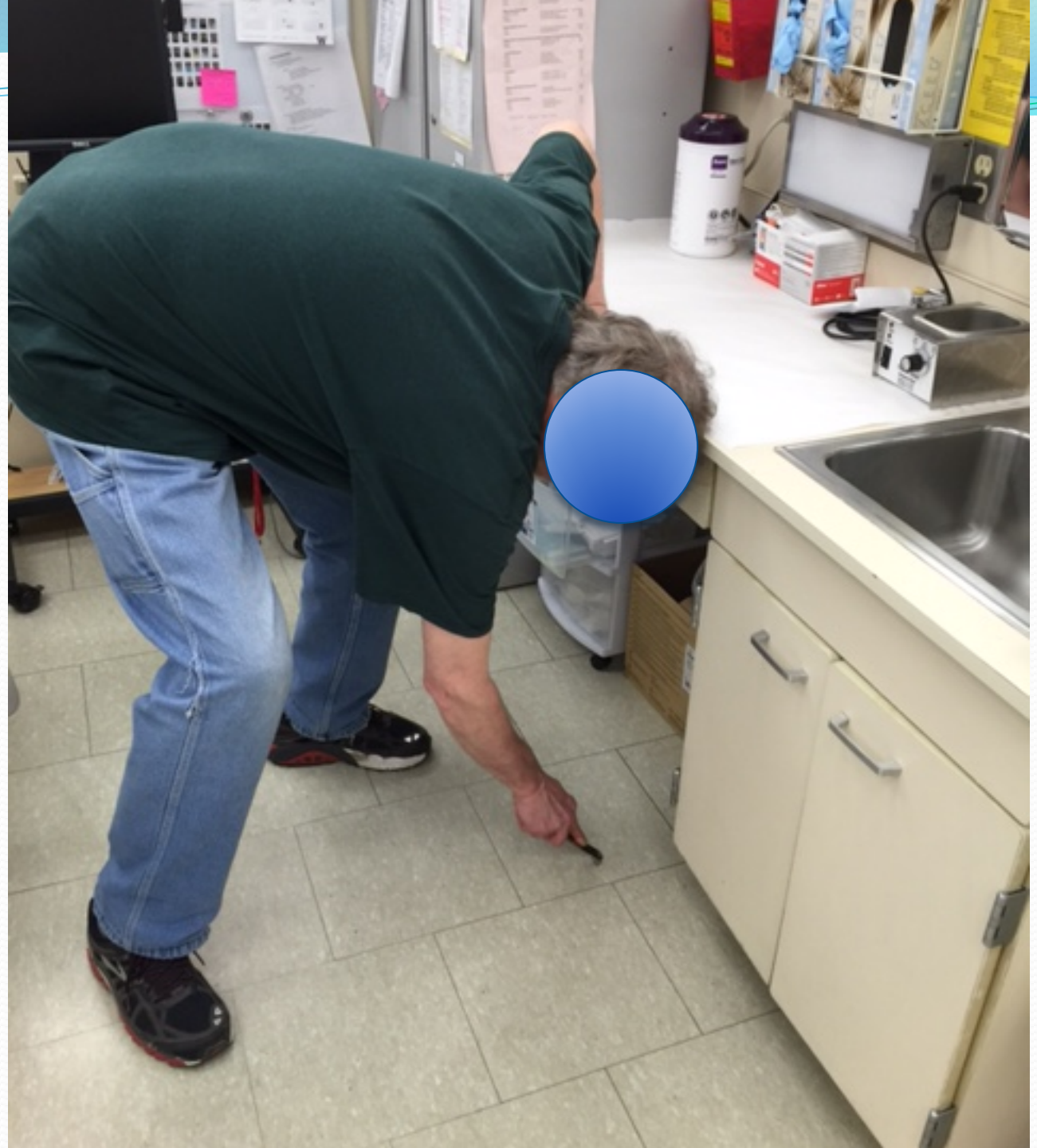
BOLT PLACEMENT PREFERENCES:

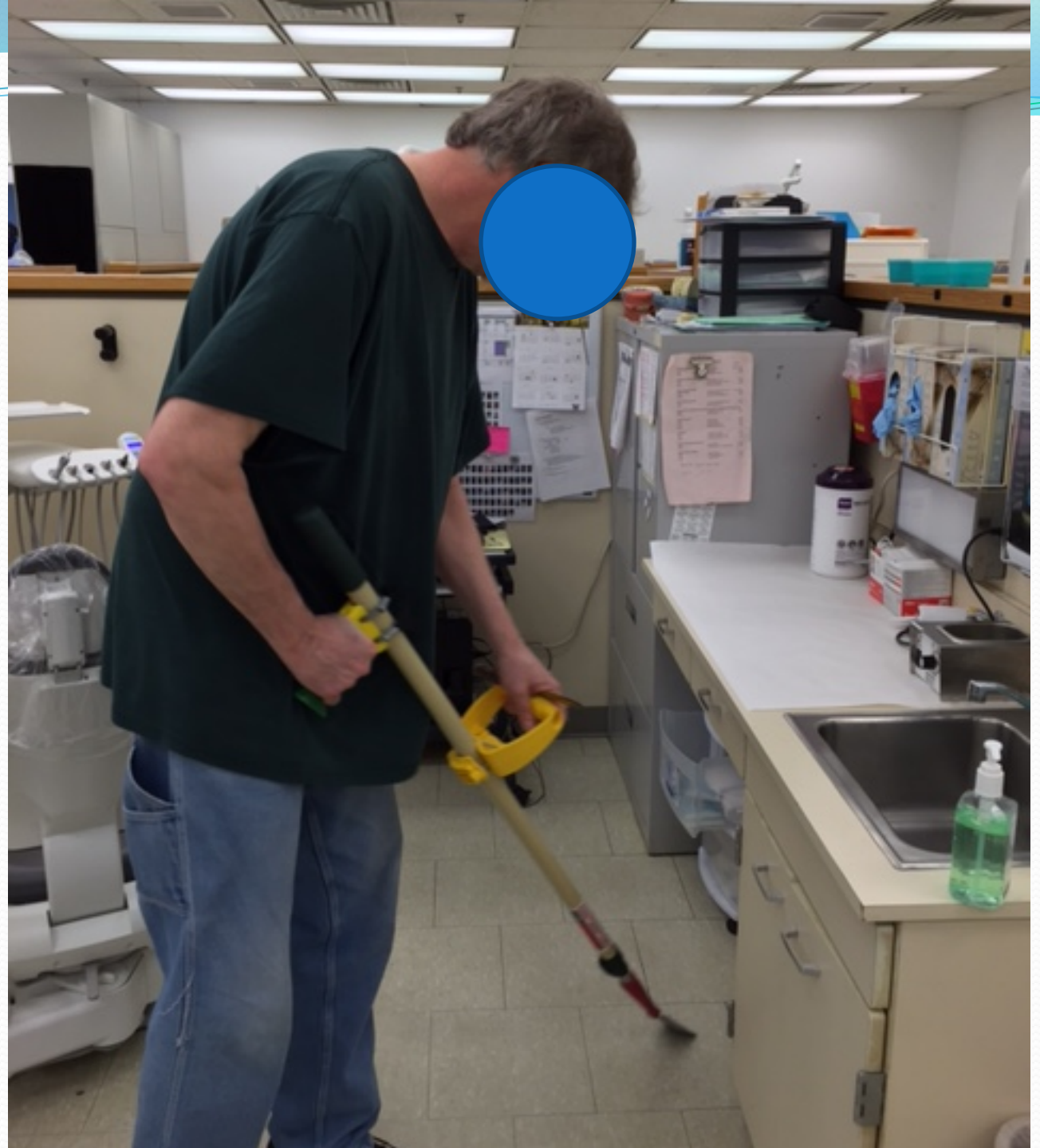
WOMEN	MEN
18% of women preferred HI 57% of women preferred MID 19% of women preferred LOW	61% of men preferred HI 26% of men preferred MID 5% of men preferred LOW

Custodians under 5'	Custodians 5'0" to 5'5"	Custodians 5'6" to 5'10"	Custodians 5'11"+
(none preferred HI) 50% preferred MID 50% preferred LOW	20% preferred HI 61% preferred MID 14% preferred LOW	67% preferred HI 25% preferred MID 6% preferred LOW	73% preferred HI 20% preferred MID (none preferred LOW)

Vacuum Backpack Storage

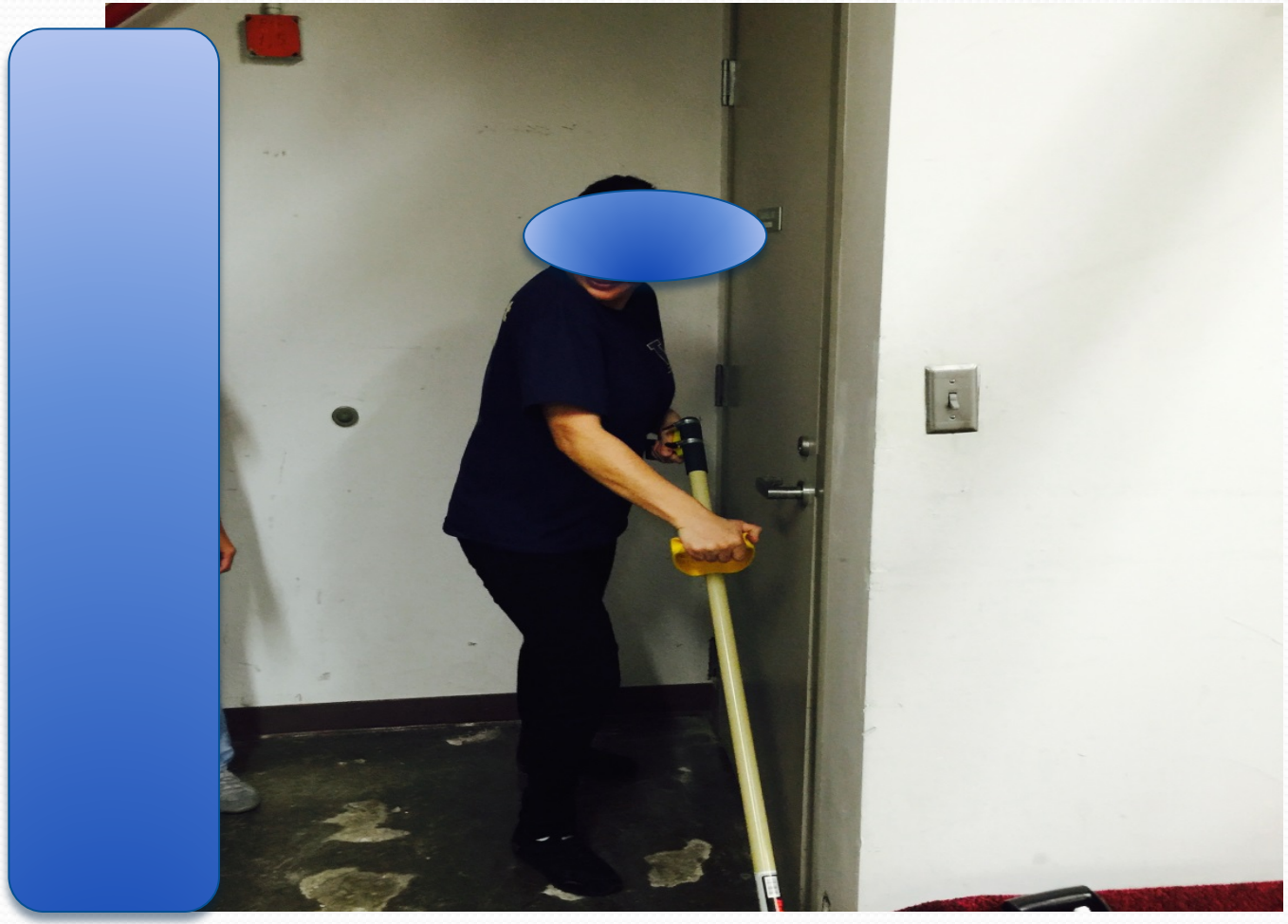
TASK 2: SCRAPING FLOORS



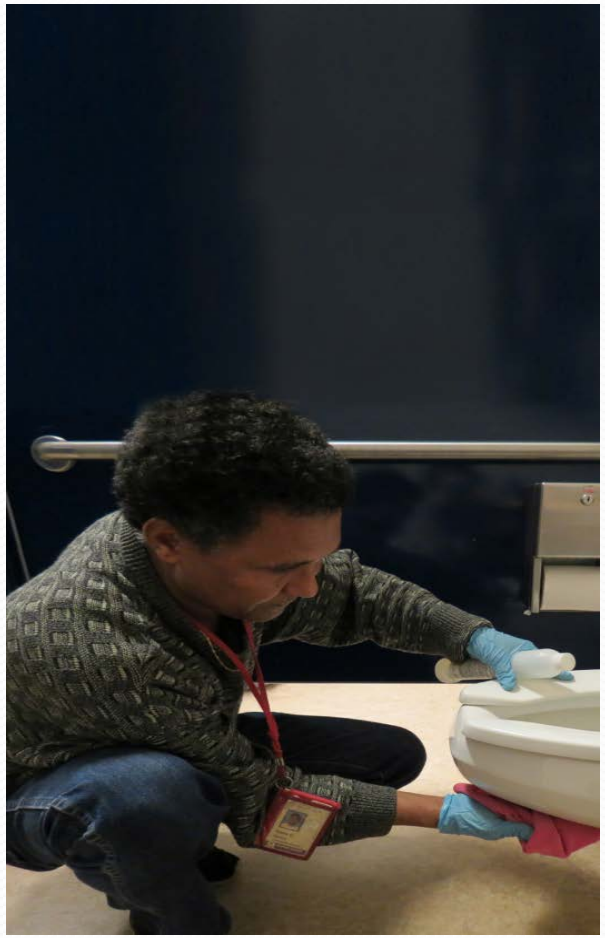


TASK 2: SCRAPING FLOORS NEW TOOL

"THIS WILL SAVE OUR BACKS"



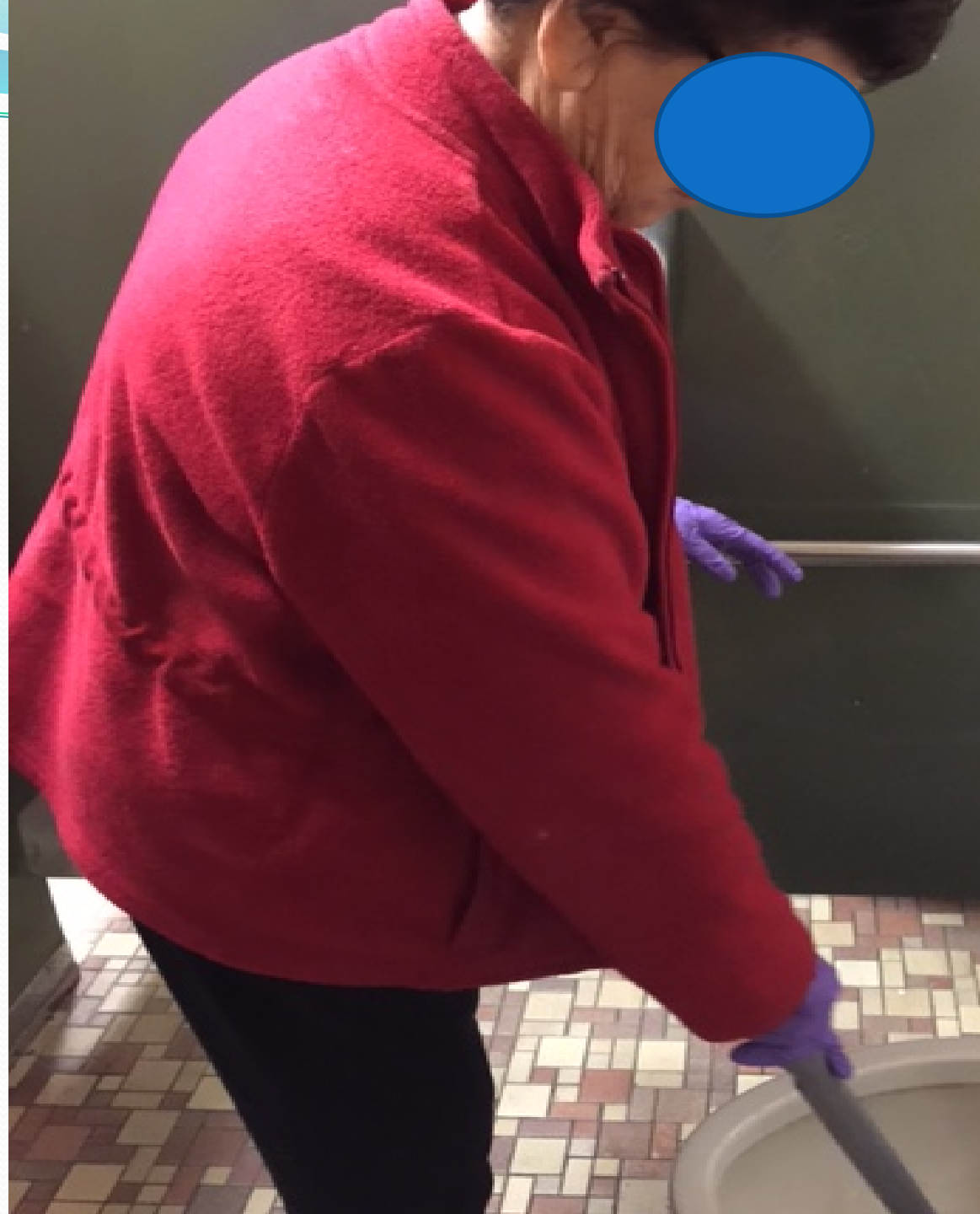
TASK 3: CLEANING TOILETS



TASK 3: CLEANING TOILETS

TRADITIONAL TOILET BRUSH

LONGER HANDLED BRUSH



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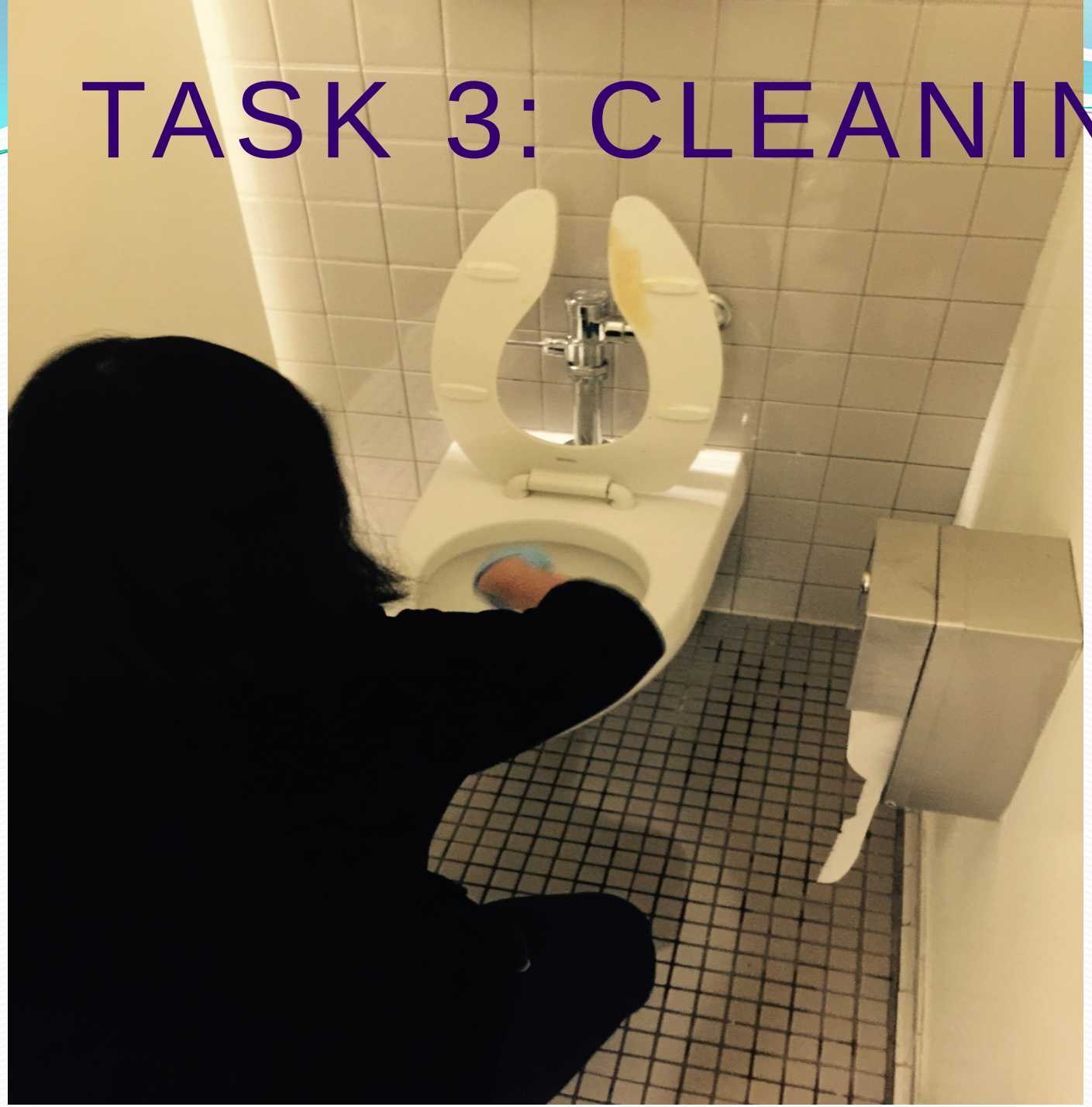

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CLEANING TOILET WITH LONG-HANDLED BRUSH

TASK 3:

CLEANING TOILETS

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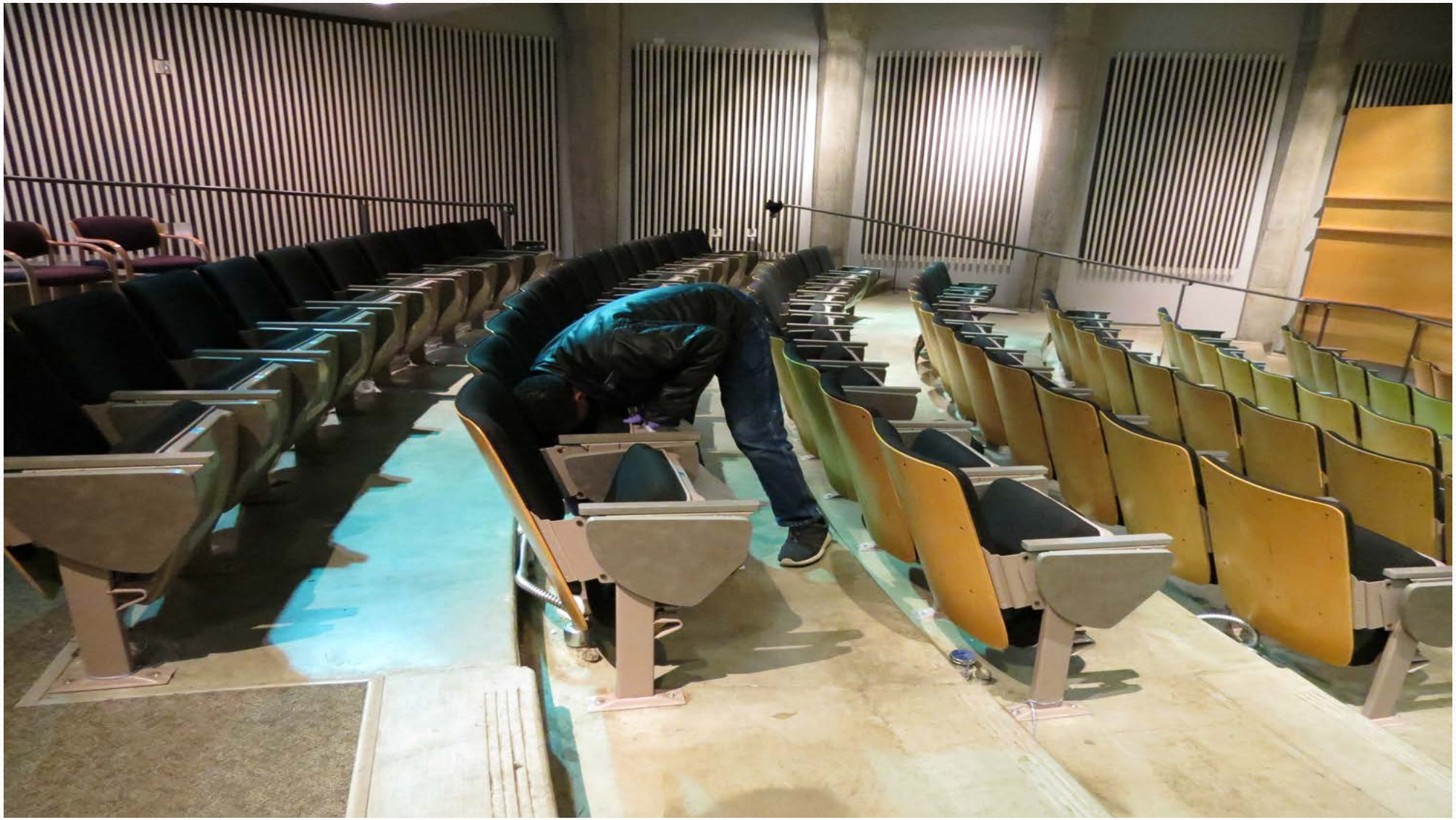
TASK 3:

CLEANING TOILETS

Magnetic
door holder

TASK 4: PICKING UP TRASH FROM THE FLOOR



TASK 4: PICKING UP TRASH FROM THE FLOOR


vive
TelescoPik
Grip 'n Grab

TASK 4: PICKING UP TRASH FROM THE FLOOR

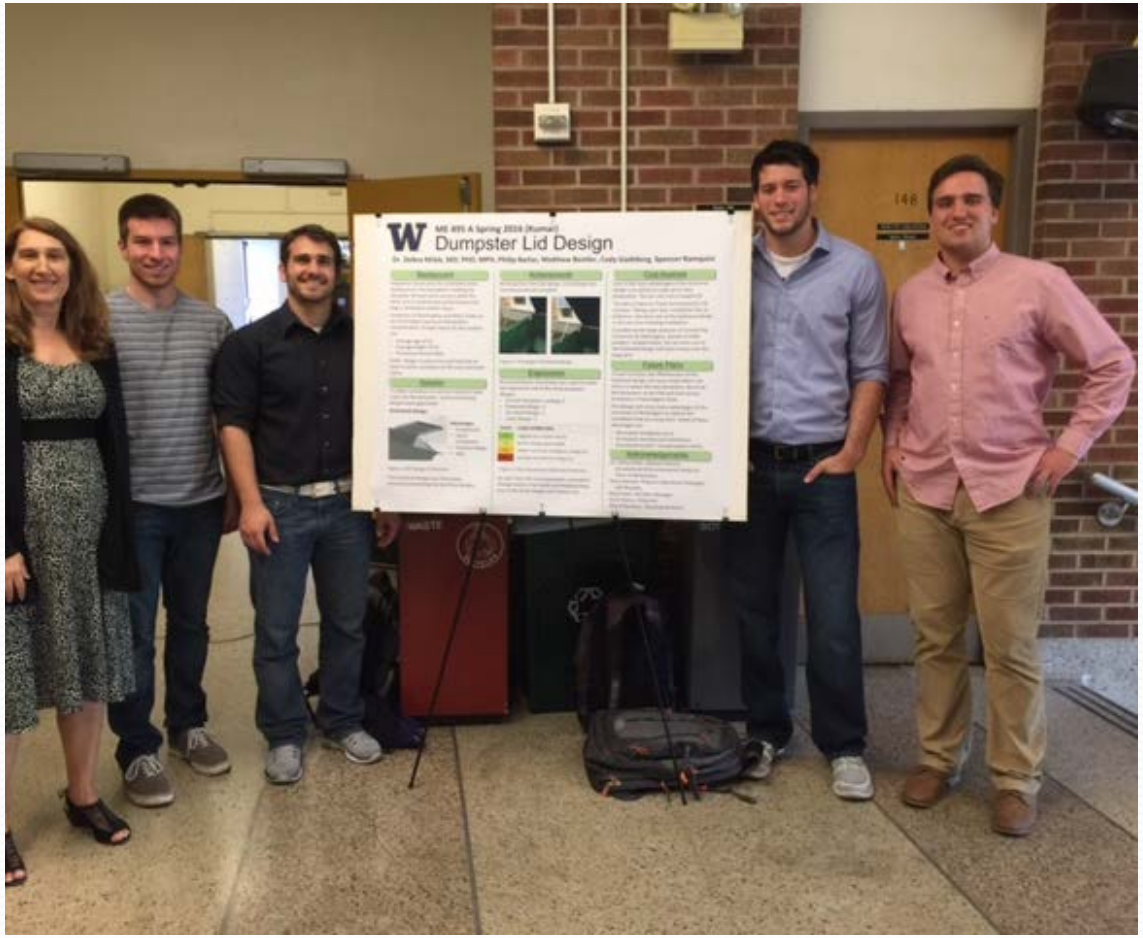
TASK 5: DUMPING TRASH INTO DUMPSTER

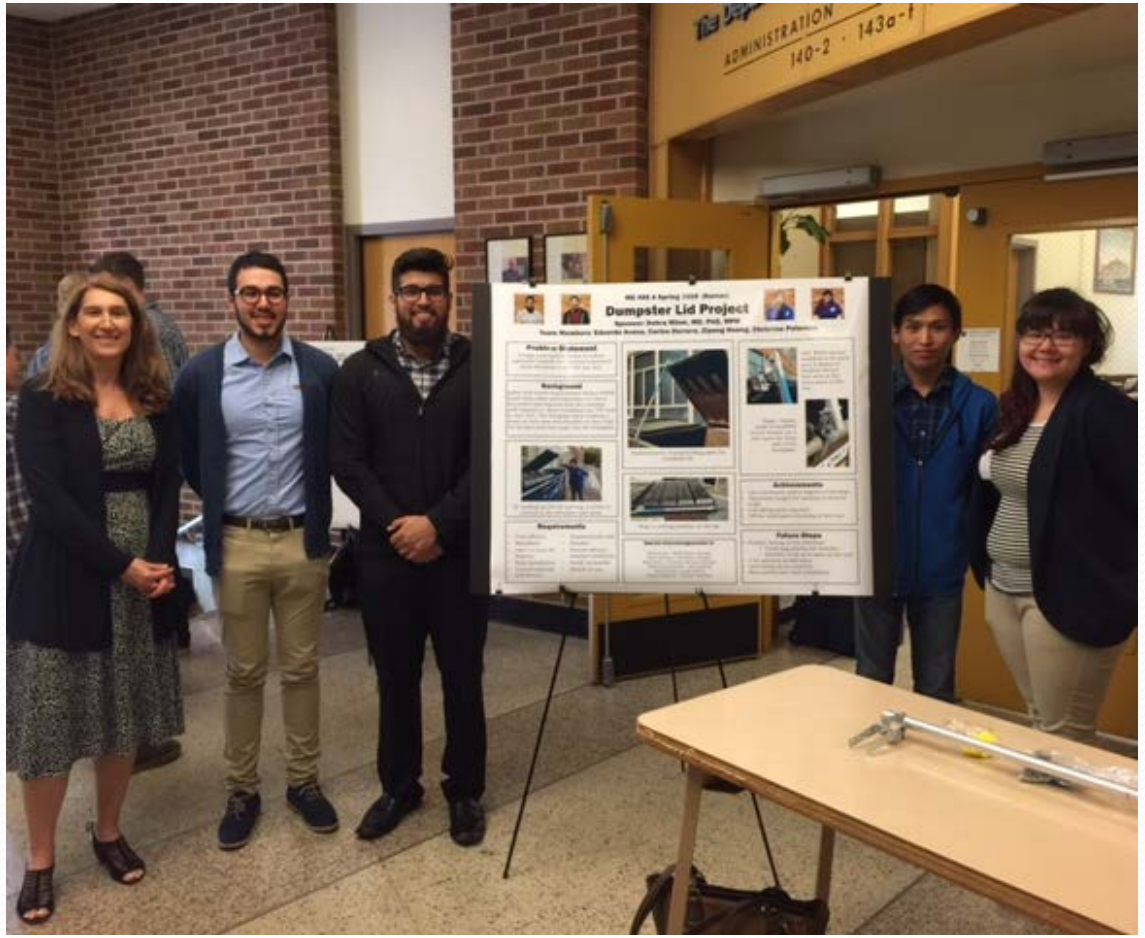
TASK : DUMPING TRASH INTO DUMPSTER (POLE)

DUMPING TRASH INTO DUMPSTER

Using the Dumpster Pole

UW Engineering Students Work on Dumpster Lid Design





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
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4. ***Training***
   - ***and Implementation for Tasks***
5. **Post-Modification Survey**
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Demographic Characteristics of Custodial Workers (Pre-Survey n=133, Post-Survey n=106)

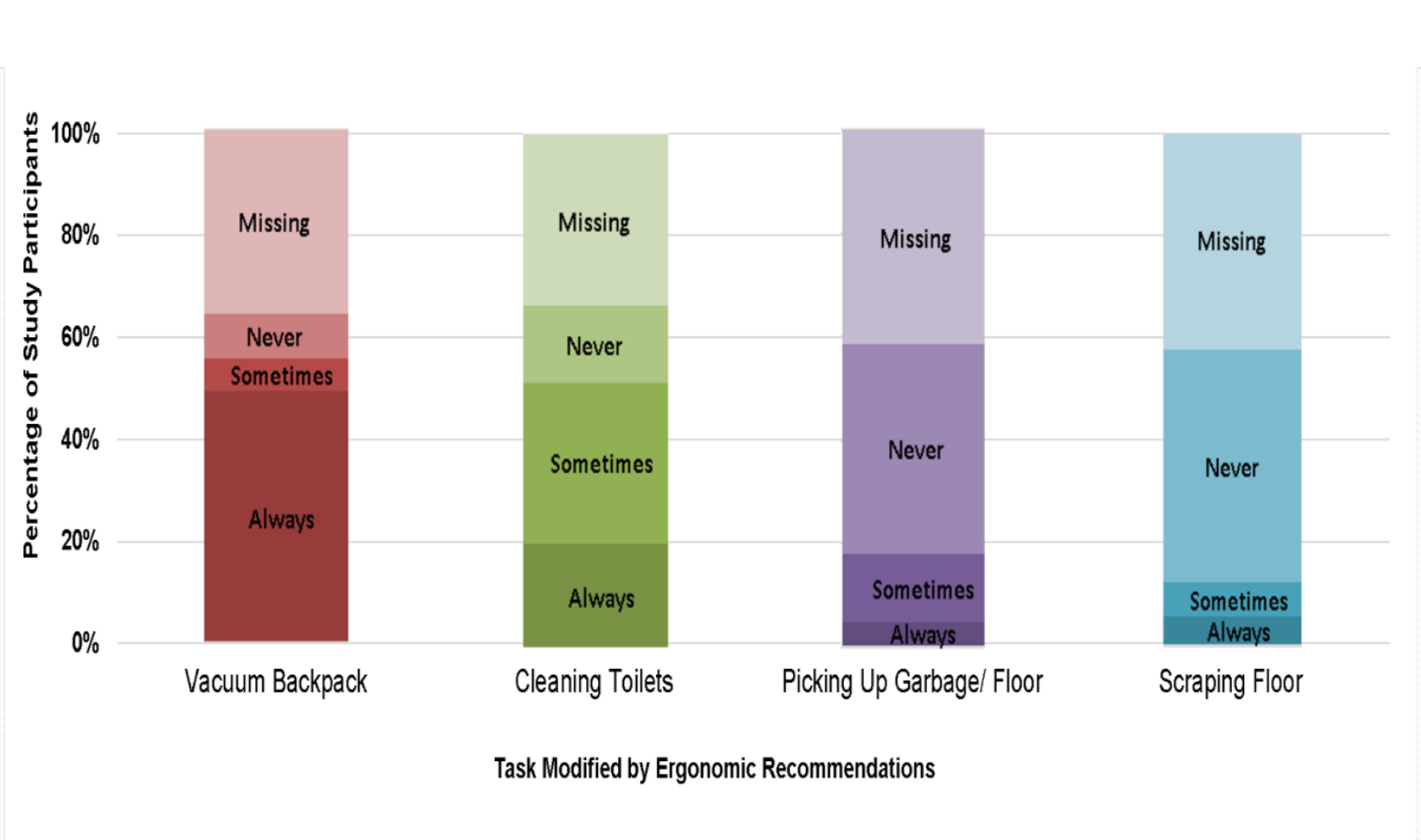
	Pre-Modification Survey (n=133)		Post-Modification Survey (n=106)	
	n	(%)	n	(%)
Age				
<40 years	10	(8)	9	(9)
40-49 years	29	(23)	21	(22)
50-59 years	51	(40)	42	(43)
60+ years	37	(29)	25	(26)
Missing	6	--	9	--
Sex				
Female	76	(62)	55	(58)
Male	47	(38)	40	(42)
Missing	10	--	11	--
Years Worked at Current Job				
0-5 years	26	(21)	27	(28)
6-10 years	24	(19)	18	(19)
11-15 years	26	(21)	19	(20)
16-20 years	29	(23)	15	(15)
21+ years	20	(16)	17	(18)
Missing	8	--	10	--
BMI				
Underweight (<18.5)				
Normal (18.5-25)				
Overweight (25-30)				
Obese (30+)				

	Pre-Modification Survey (n=133)		Post-Modification Survey (n=106)	
	n	(%)	N	(%)
Height				
≤ 5'5 M/5'0 F)	27	(27)	29	(37)
5'6-5'8 M/5'1-5'2 F	38	(39)	23	(30)
Tall (≥ 5'9 M/5'3 F)	33	(34)	26	(33)
Missing	35	--	28	
Primary Language				
English	77	(62)	60	(66)
Other	48	(38)	31	(34)
Missing	8	--	15	
Primary Handedness				
Right	113	(90)	79	(89)
Left/Both	13	(10)	10	(11)
Missing	7	--	17	
Attended Training				
None	--	--	2	(2)
Some Trainings	--	--	36	(35)
All Trainings	--	--	66	(63)
Missing	--	--	2	
Taken Survey Before				
No	125	(96)	33	(33)
Yes	5	(4)	68	(67)
Missing	3	--	5	

Training Participation and Receipt of Modified Tools

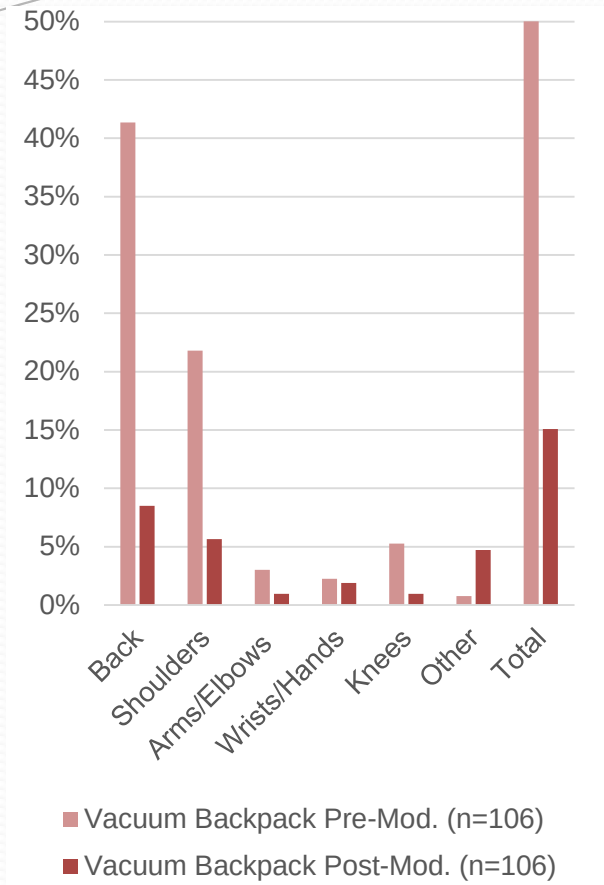
	Vacuum Backpack		Cleaning Toilets		Picking Up Garbage from Floor		Scraping Floor	
	n	(%)	n	(%)	n	(%)	n	(%)
UW Custodians (n = 218)								
Attended Training	189	(86	185	(85)	185	(85)	185	(85)
Study Participants (n=106)								
Attended Training								
Yes	96	(95)	93	(91)	83	(86)	97	(88)
No	5	(5)	9	(9)	13	(14)	11	(12)
Missing	5	--	4	--	10	--	16	--
Received New Tool								
Yes	58	(85)	55	(90)	17	(25)	9	(15)
No	10	(15)	6	(10)	51	(75)	51	(85)
Missing	38	--	45	--	38	--	46	--

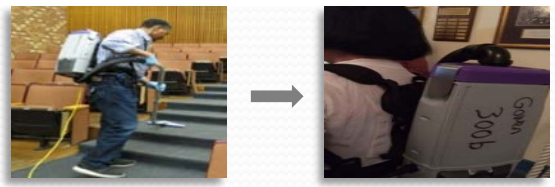
Frequency of Use of Modified Tools/Methods



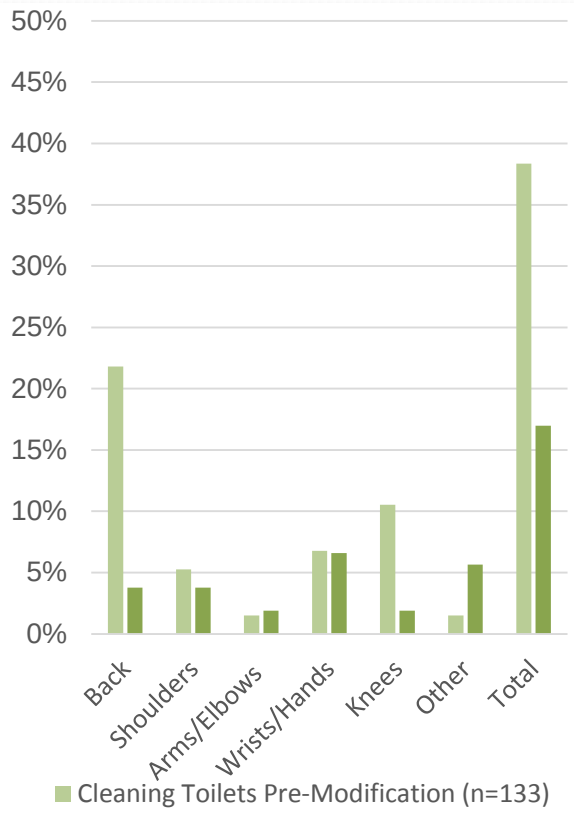
DID WE REDUCE DISCOMFORT?

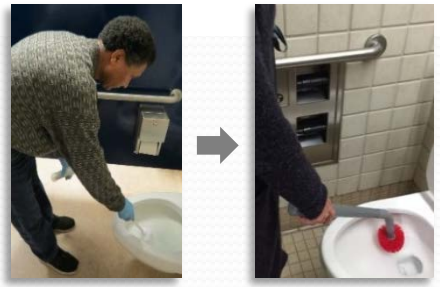
High Discomfort (5-7) Pre- and Post-Modification Among All Surveyed



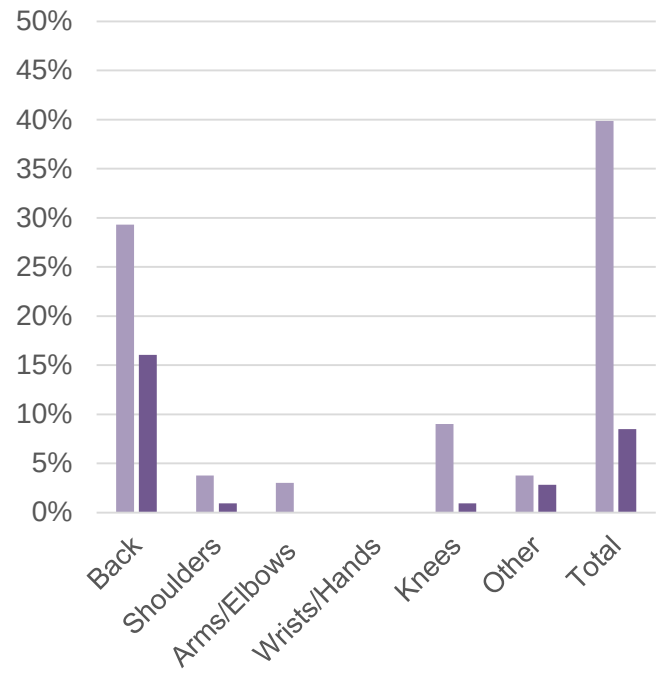


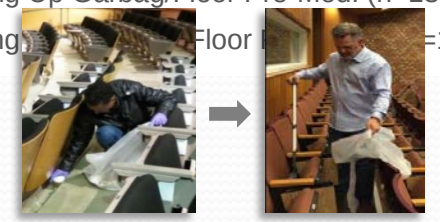
Vacuum Backpack: Training and Fit



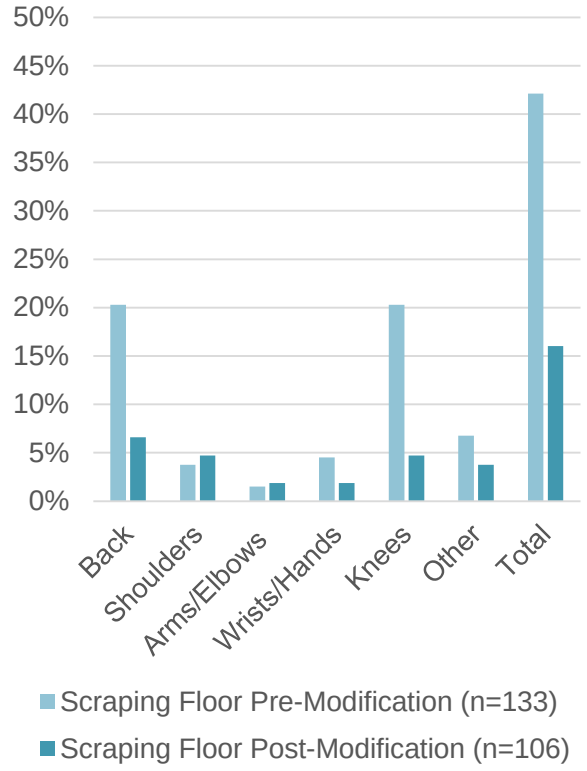


Modification: reduces trunk flexion



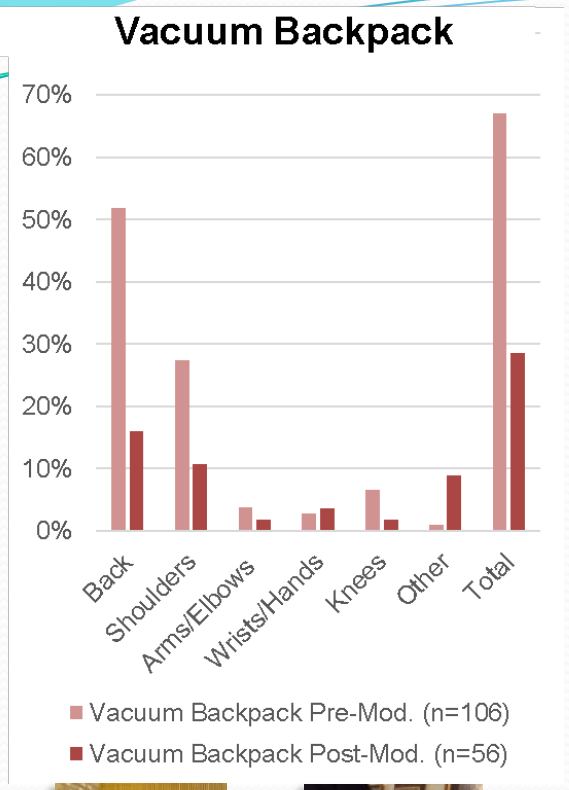


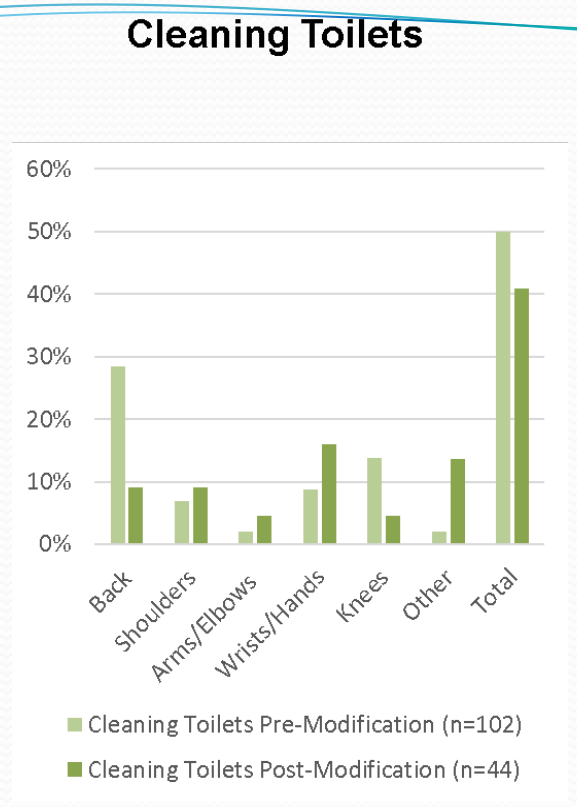
Modification: Long trash **grabber** reduces trunk flexion

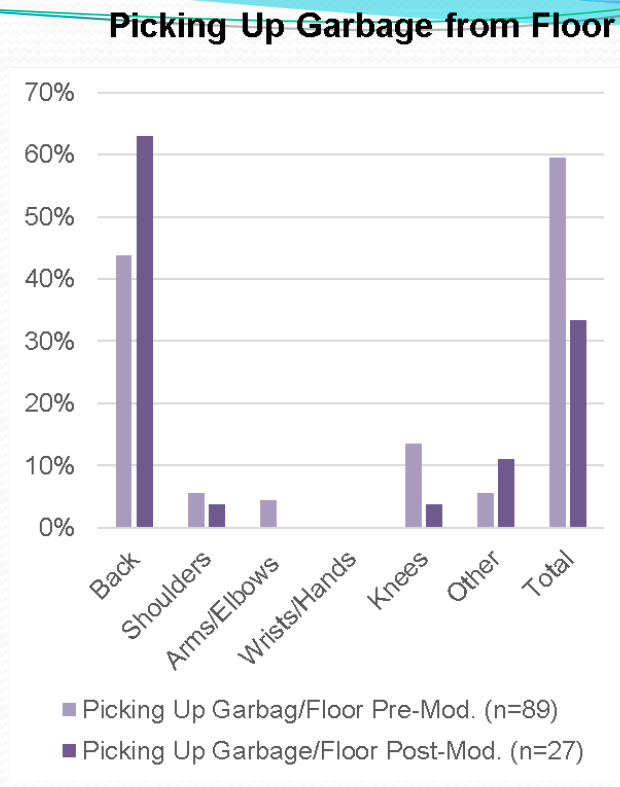


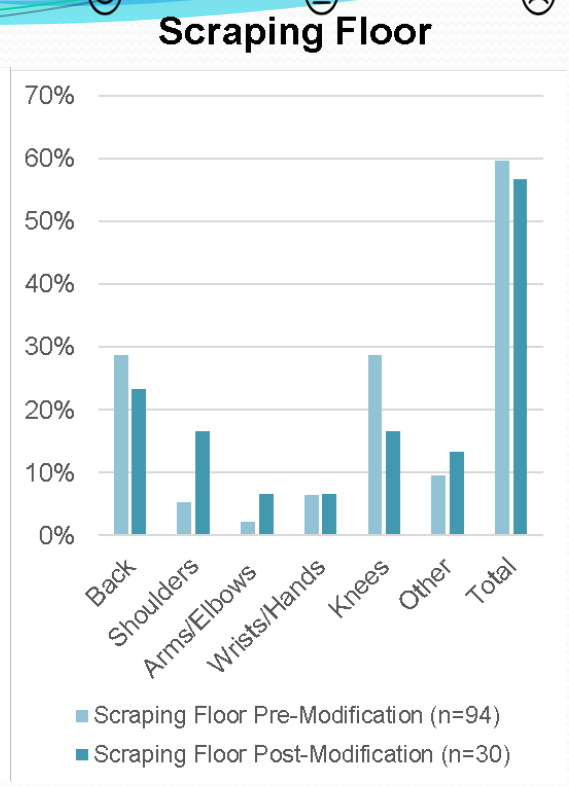
Modification: Long-handled **scraper** reduces crouching or flexion

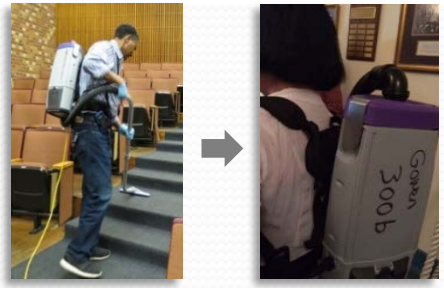
High Discomfort Among Any Level of Discomfort Post-Modification











Modification: Systematically tightening harness straps personalizes backpack fit

Modification: Long handled toilet brush reduces bending over

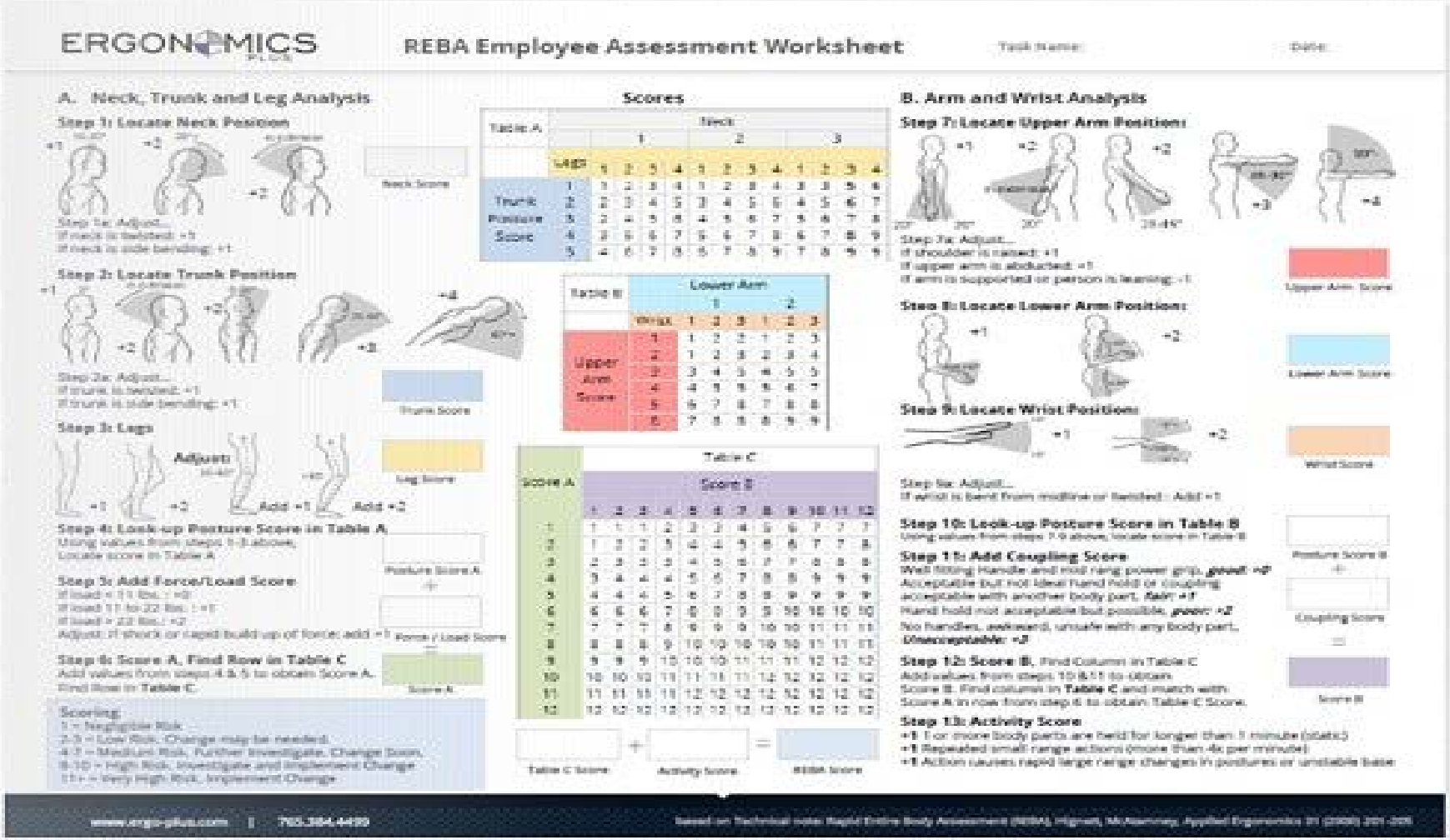
Modification: Long trash grabber reduces picking up trash by hand

Modification: Long-handled scraper reduces kneeling and bending

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)



File Edit Help

Task Information

REBA Score

Analyst: Steve Davis

Job Name: Cleaning Toilets - OLD Short Handled

Workstation ID: UW Custodial Grant 2016

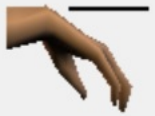
Hand

- (•) Right Side
- ( ) Left Side

Wrist

<-15

Neutral



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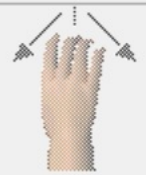


Side Bent or Twist

Neck

< -20

0 to 20

> 20

[ ] Neck is twisting or side bending

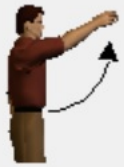
Upper Arms

<-20

-20 to 20

21 to 45

46 to 90



>+90

[ ] Shoulder is raised

[ ] Upper arm is abducted

[ ] Arm is supported

Leg

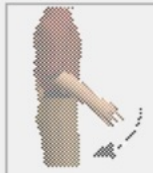
Stable

Unstable

30 to 60

> 60

Lower Arms



0 to 60

60-100

> 100

Trunk

< -20

-20 to 0

Neutral

0 to 20

21 to 60

> 60

[ ] Trunk is twisting or side bending

Coupling/Grip

- ( ) Good
- (•) Fair
- ( ) Poor
- ( ) Unacceptable

Force or Load

<5 kg

[ ] Shock/rapid build up of force

Muscle Use

[x] Static, eg. held for longer than 1 min

[ ] Repeated more than 4 times/min

[ ] Rapid large posture change or unstable base

Rapid Entire Body Assessment

File Edit Help

Task Information

REBA Score

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

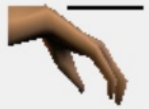
Hand

- (•) Right Side
- ( ) Left Side

Wrist

<-15

Neutral



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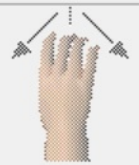


Side Bent or Twist

Neck

< -20

0 to 20

> 20

[ ] Neck is twisting or side bending

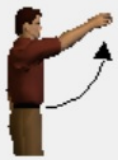
Upper Arms

<-20

-20 to 20

21 to 45

46 to 90



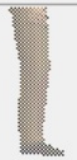
>+90

[ ] Shoulder is raised

[ ] Upper arm is abducted

[ ] Arm is supported

Leg



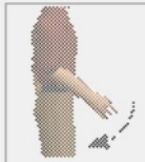
Stable

Unstable

30 to 60

> 60

Lower Arms



0 to 60

60-100

> 100

Trunk

< -20

-20 to 0

Neutral

0 to 20

21 to 60

Trunk between 21 and 60 deg. (Flexion)

> 60

[ ] Trunk is twisting or side bending

Coupling/Grip

- (•) Good
- ( ) Fair
- ( ) Poor
- ( ) Unacceptable

Force or Load

[ ] Shock/rapid build up of force

Muscle Use

[x] Static, eg. held for longer than 1 min

[ ] Repeated more than 4 times/min

[ ] Rapid large posture change or unstable base

Rapid Entire Body Assessment (REBA) SCORING (Ergonomics Plus)

Score	Level of MSD Risk
1	negligible risk, no action required
2-3	low risk, change may be needed
4-7	medium risk, further investigation, change soon
8-10	high risk, investigate and implement change
11+	very high risk, implement change

RAPID ENTIRE BODY ASSESSMENTS

TASK/Tool	REBA PRE-MOD	REBA POST-MOD
SCRAPER	10 (High Risk)	3 (Low Risk)
TOILET	7 (Medium Risk)	1-2 (Low Risk)
PICK UP	8-10 (High Risk)	3-4 (Low Medium Risk)
VACBAC*	4 (Medium)	3 (Low Risk)

- *REBA doesn't fully account for static load

Summary

- Custodians participated together with managers, supervisors, & health and safety professionals to address ergonomic aspects of their work
- Discomfort reports were consistent with WC injury 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
- Role for Participatory Ergonomics in Injury Prevention
- The project enhanced the safety culture of the department

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**
  - **IF YOU DON'T ASK THE QUESTION, YOU MAY NOT LEARN THE ANSWER**

Challenges

- Lack of availability or quantity of “ergo” tools
- Lack of adjustability or variety in tools
- Variation in timing of pre and post: school in/out
- Variability in supervisor engagement or knowledge regarding ergonomic aspects
  - Supervisors need the same training as custodians
    - Ergo education
      - 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 in some cases

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 and COMMUNICATION IS KEY**
  - **PLANNING AND FOLLOW UP ARE ESSENTIAL**
  - **RELATIONSHIP BUILDING**
- **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**
- **WORKER AND MANAGEMENT ENGAGEMENT ESSENTIAL**
- **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 and COLLABORATION AND ENGAGEMENT OF LEADERSHIP**

After the Grant---Facilities is continuing the process

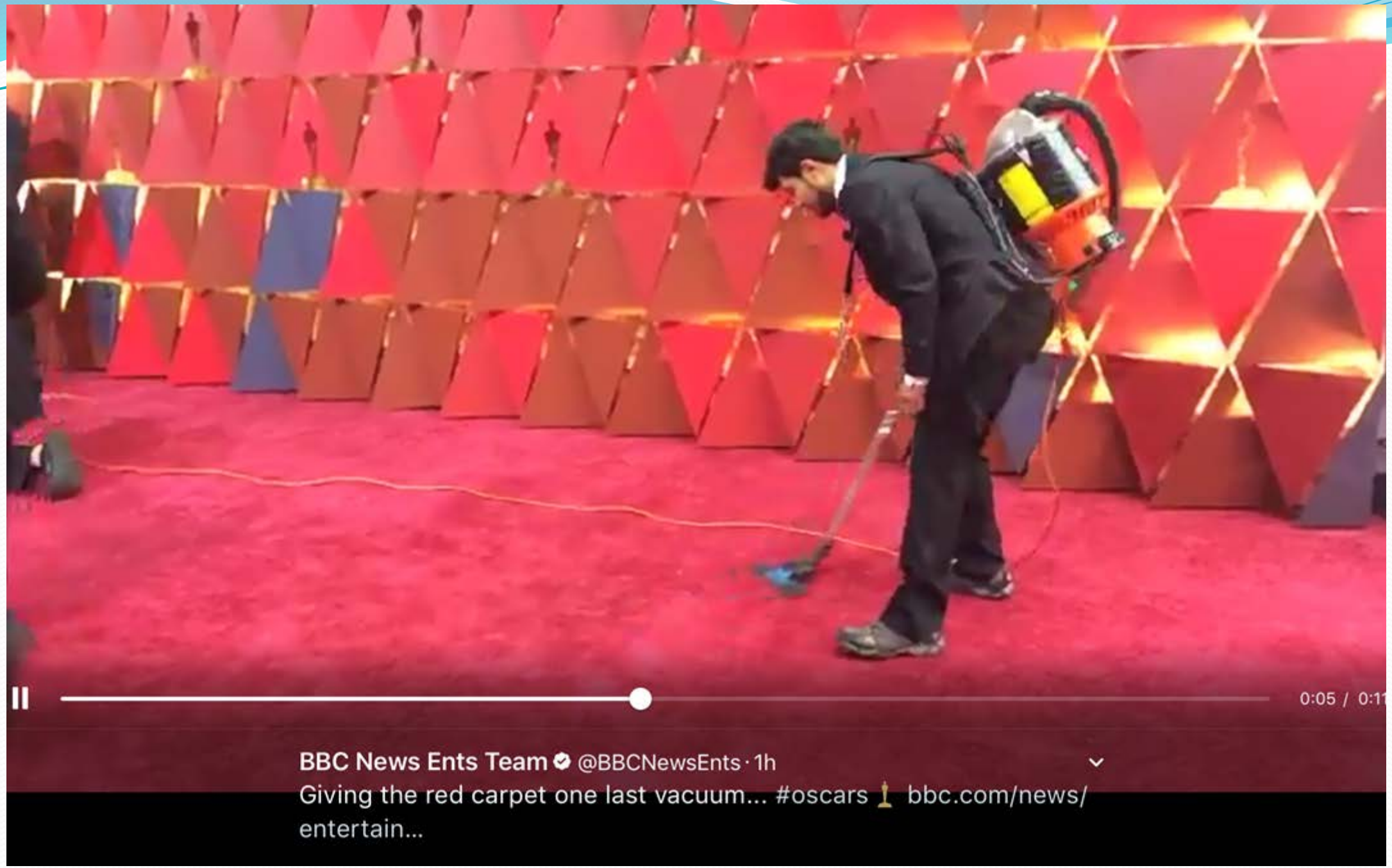
- Weekly participatory meetings
- Ergonomics safety culture continues to mature
- Utilize small group tool evaluation surveys to max custodian input
- Completed 3 additional tasks from the survey
  - Distribution and Installation Ongoing
- Addressed several task elements not on the survey
- Attempting to influence custodian tool manufacturers
- Supervisor training-→train the trainer
  - Training refreshers planned for custodians

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), Allyson O'Connor (HIPRC, DEOHS), Karen Segar (HIPRC)

- **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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