

Using the Lumbar Motion Monitor to Assess Housekeeper Room-Cleaning Tasks

Summary Trunk Motion and Low Back Disorder Risk Data from Various Research Studies

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The Lumbar Motion Monitor (LMM)

- An electro-goniometer, developed in the late 1980s, by researchers at The Ohio State University
- Tracks instantaneous movements of the back in its three planes of motion (i.e., lateral/coronal, sagittal, twisting/transverse planes of motion)
- Allows one to determine the velocity and acceleration of trunk movement required for work tasks
- Is worn “on-site,” as employees perform their actual jobs



The Lumbar Motion Monitor (LMM)

- Is used by researchers and practitioners from around the world (e.g., Australia, Canada, Denmark, South Africa, Taiwan, UK, US) to study lifting tasks and jobs that involve use of the spine 
- Can be used as inputs to a validated low-back disorder (LBD) risk model
- The LBD Risk model was developed from the analysis of work requirements for over 400 high- and low-risk jobs
- Publication of the LBD Risk model (*Spine*, 1993) was ranked 59th on the list of 100 most-cited spine articles (*European Spine Journal*, 2012), a measure of the importance of spine-related research

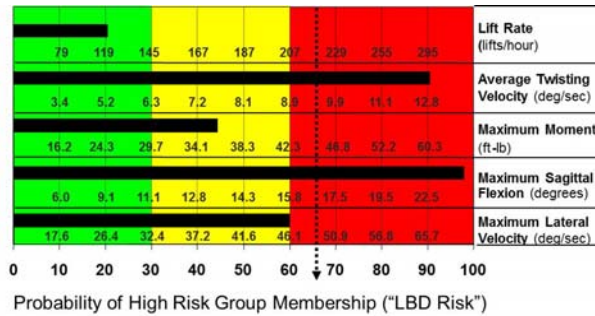
The LMM Low-Back Disorder (LBD) Risk Model

- Industrial surveillance research found there to be five workplace and trunk motion measures that, together, best distinguished “high-risk” jobs from “low-risk” jobs
- Independent studies have also validated the biomechanical relationships between each of these five measures and loading on the lumbar spine
- Each measure contributes equally to the model
- Risk benchmarks
 - “**High Risk**” - LBD Risk values greater than 60%
 - “**Moderate Risk**” – LBD Risk between 30% and 60%
 - “**Low Risk**” - LBD Risk values below 30%

The LMM Low-Back Disorder (LBD) Risk Model

Example LBD Risk Chart

- This risk model is used to determine the probability that a task monitored with the LMM would have a profile similar to jobs in a historical data base that had high numbers of LBDs associated with them
- The magnitude of each measure of a task of interest is shown by the five bars
- The dotted line indicates the LBD Risk value for the task
- In this example, LBD Risk is 65% (“high risk”)



Study 1

USING THE LMM TO ASSESS HOUSEKEEPING TASKS IN AN EAST COAST HOTEL

Study 1 – East Coast Hotel: LBD Risk Results

- The LMM was worn by three experienced housekeepers working in a full-service hotel
- Each housekeeper cleaned double-bed rooms following guest checkout

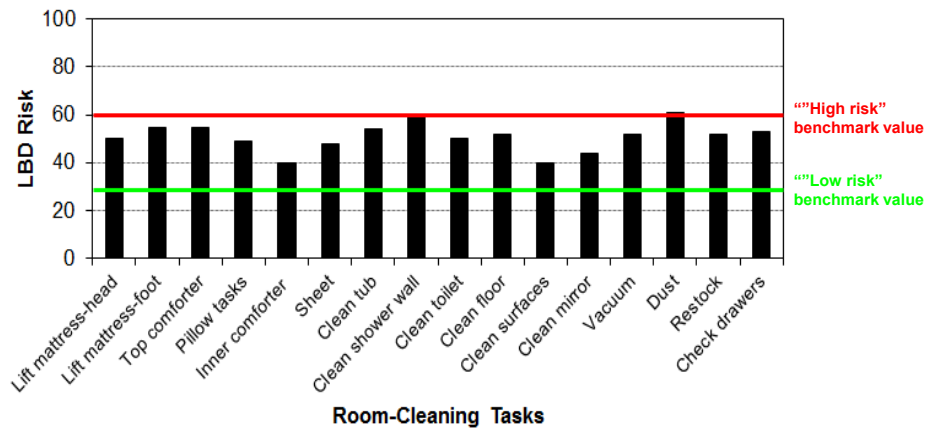


Study 1 – East Coast Hotel: LBD Risk Results

- The cleaning tasks monitored included:
 - **Bed-Making**
 - Lifting mattress at head of bed
 - Lifting mattress at foot of bed
 - Taking top comforter on/off
 - Taking pillows on/off bed
 - Taking pillowcases off/on
 - Taking inner comforter on/off
 - Taking sheets on/off
 - **Bathroom-Cleaning**
 - Cleaning tub
 - Cleaning shower wall
 - Cleaning toilet
 - Cleaning floor
 - Cleaning other surfaces
 - Cleaning mirror
 - **Other**
 - Vacuuming
 - Dusting
 - Replenishing from cart
 - Checking furniture drawers

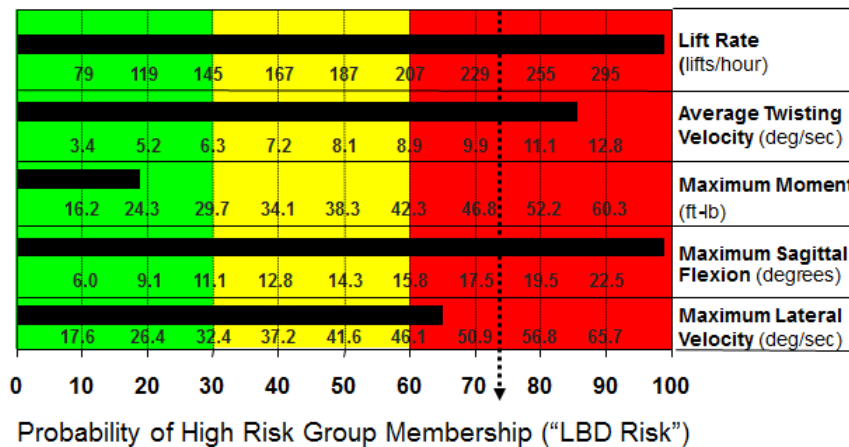
Study 1 – East Coast Hotel: LBD Risk Results

▪ LBD Risk results – individual tasks



Study 1 – East Coast Hotel: LBD Risk Results

▪ LBD Risk results – job risk across tasks = 73%



Study 1 – East Coast Hotel: LBD Risk Results

- LBD Risk results – interpretation
 - No LBD Risk values for any room-cleaning task were considered to be “low-risk”
 - Most tasks would be considered “moderate risk”
 - Two room-cleaning tasks would be considered “high risk”
 - Cleaning shower walls
 - Dusting
 - Overall, the LBD Risk for the job is **high** (73%)

Study 2

USING THE LMM TO ASSESS HOUSEKEEPING TASKS IN A MIDWEST HOTEL

Study 2 – Midwest Hotel: LBD Risk Results

- The LMM was worn by three experienced housekeepers working in a full-service hotel
- Each housekeeper cleaned one king bed checkout room and one double bed checkout room

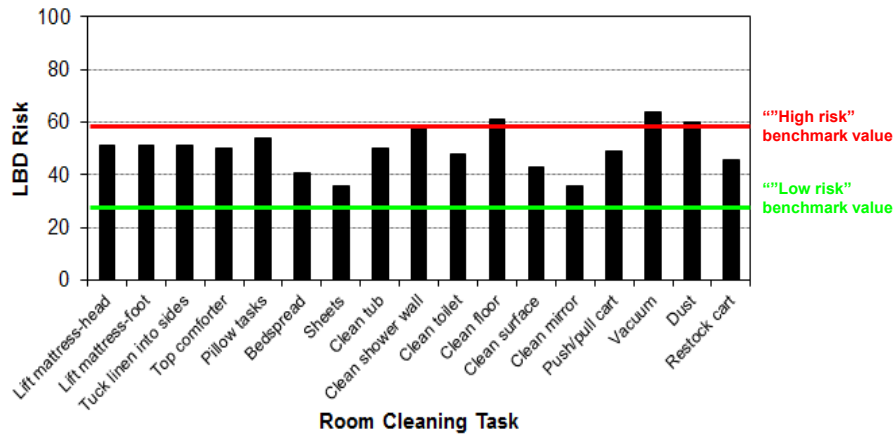


Study 2 – Midwest Hotel: LBD Risk Results

- The cleaning tasks monitored included:
 - **Bed-Making**
 - Lifting mattress at head of bed
 - Lifting mattress at foot of bed
 - Tucking linen into sides of mattress
 - Taking top comforter on/off
 - Taking pillows on/off bed
 - Taking pillowcases off/on
 - Taking bedspread off/on
 - Taking sheets off/on
 - **Bathroom-Cleaning**
 - Cleaning tub
 - Cleaning shower wall
 - Cleaning toilet
 - Cleaning floor
 - Cleaning other surfaces
 - Cleaning mirror
 - **Other**
 - Pushing/pulling supply cart
 - Vacuuming
 - Dusting
 - Replenishing from cart

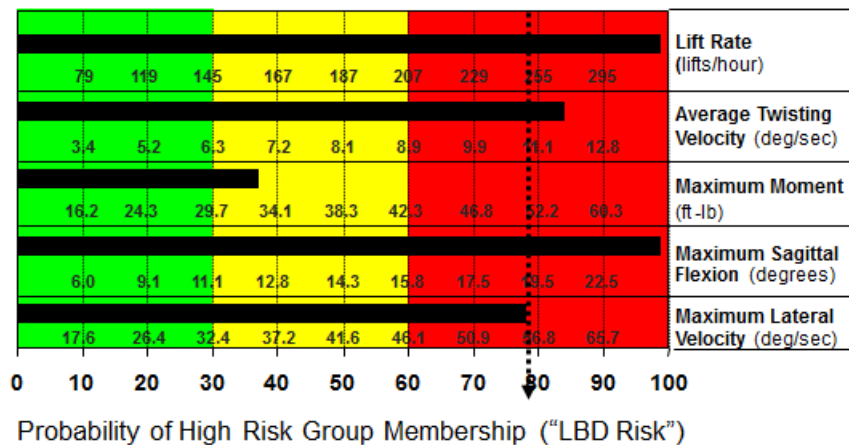
Study 2 – Midwest Hotel: LBD Risk Results

▪ LBD Risk results – individual tasks



Study 2 – Midwest Hotel: LBD Risk Results

▪ LBD Risk results – job risk across tasks = 79%*



* Cart pushing/pulling is not included in this risk assessment

Study 2 – Midwest Hotel: LBD Risk Results

- LBD Risk results – interpretation
 - No LBD Risk values for any room-cleaning task were considered to be “low-risk”
 - Most tasks would be considered “moderate risk”
 - Four room-cleaning tasks would be considered “high risk”
 - Cleaning shower walls
 - Cleaning bathroom floor
 - Vacuuming
 - Dusting
 - Overall, the LBD Risk for the job is **high** (79%)

Study 3

USING THE LMM TO COMPARE THE IMPACT OF USING LONG- HANDLED TOOLS FOR CLEANING

Study 3 – Impact of Long-Handled Tool Use

- A total of 12 female housekeepers who worked in a full-service Southern California hotel, wore the LMM
- Each housekeeper performed bathroom-cleaning and dusting tasks, in both their usual method and with a tool whose handle could be extended

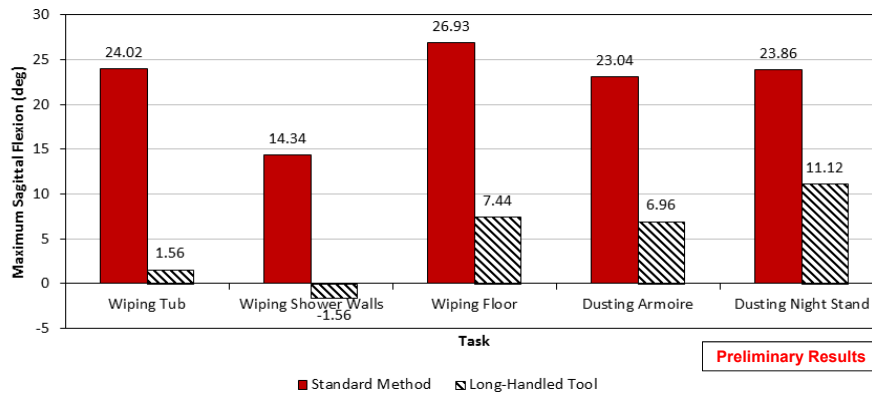


Study 3 – Impact of Long-Handled Tool Use

- The cleaning tasks monitored included:
 - Bathroom-Cleaning
 - Wiping tub
 - Wiping shower walls
 - Wiping floor
 - Dusting
 - Dusting armoire
 - Dusting night stand

Study 3 – Impact of Long-Handled Tool Use

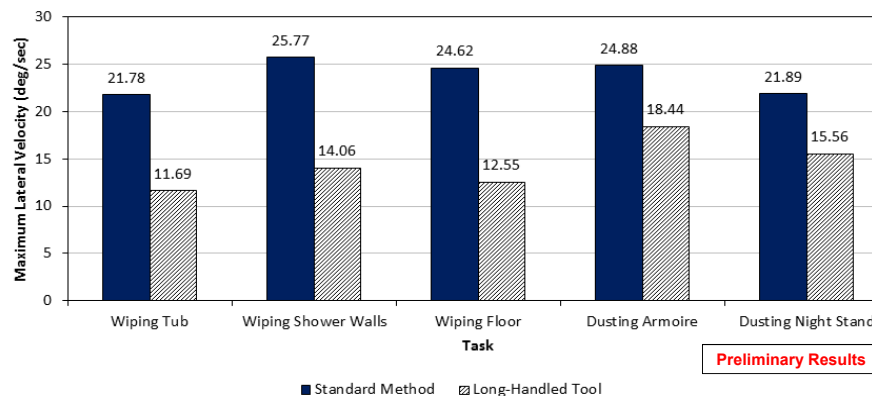
- Trunk motion results – maximum forward/sagittal flexion



- The amount of forward bending required to do all tasks was, statistically, significantly lower when the long-handled tool was used

Study 3 – Impact of Long-Handled Tool Use

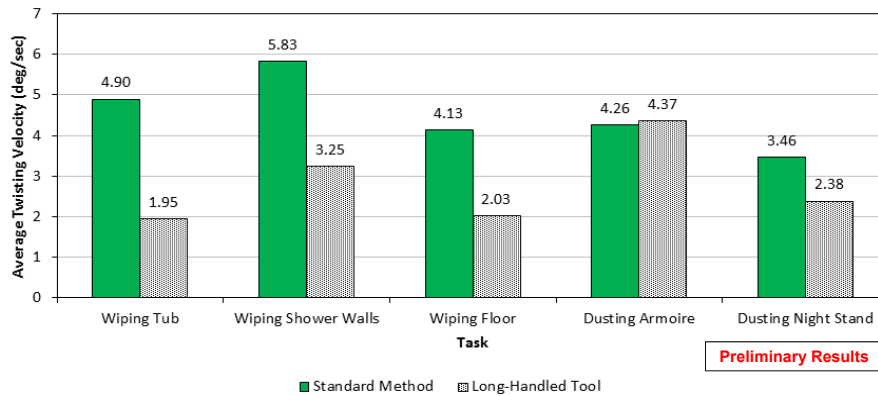
- Trunk motion results – maximum lateral velocity



- The speed/velocity at which the spine moved laterally (side-to-side) to do all tasks was, statistically, significantly lower when the long-handled tool was used

Study 3 – Impact of Long-Handled Tool Use

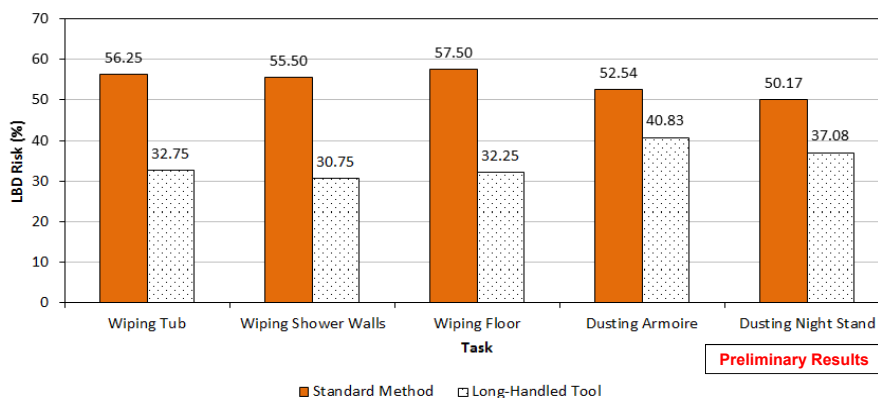
Trunk motion results – average twisting velocity



– The speed/velocity at which the spine twisted to do the three bathroom-cleaning tasks was, statistically, significantly lower when the long-handled tool was used

Study 3 – Impact of Long-Handled Tool Use

LBD Risk results



– The resulting LBD Risk values assessed for the three bathroom-cleaning and two dusting tasks all were, statistically, significantly lower when the long-handled tool was used

Study 3 – Impact of Long-Handled Tool Use

- Results summary

- From a large sample of experienced hotel housekeepers who were monitored wearing the LMM while performing common bathroom-cleaning and furniture dusting tasks:

- Most individual trunk motions were substantially and, statistically, significantly lower when long-handled tools were used, compared to normal cleaning methods
 - Overall LBD Risk values were significantly lower when these cleaning tools were used