VelocityEHS® | Accelerate®

Motion Capture Whole-Body Assessment Data Collection

Introduction

- Introduce yourself and your teammates
- Describe the reason you are visiting the workstation
- Describe the activities you will be performing
- Ask permission to take photos and videos

1. Collect job and operator information.

Job Information

Job Name

Location

Process/Equipment

Reference Number

Shift

Number of Operators Exposed

Product

Station

Description

Tasks

1
2
3
4
5
6

Operator Survey

Time on job:	_____ Year(s) _____ Month(s)
What is the most difficult part of the job?	
What improvements would you like to see for the job?	

Measurements

Hand working heights, reaches, etc.:

Operator Discomfort Survey

Body Segment	Severity (circle)				Frequency (circle)		
Left Hand/Wrist	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Right Hand/Wrist	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Left Elbow	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Right Elbow	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Left Shoulder	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Right Shoulder	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Neck	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Back	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always
Legs	Mild	Moderate	Severe	Unbearable	Seldom	Often	Always

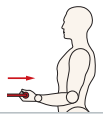
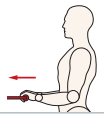
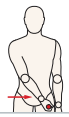
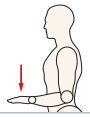
2. Collect video for motion capture processing.

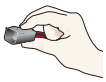
1. Keep operator's entire body (feet to top of head) centered in the frame during all movements.
2. Video should be recorded ~10' (3 m) away from the operator and from the side.
3. Minimize obstructions that block the operator or the operator's body segments.
4. Record seated tasks the same way as standing tasks; keep the operator's entire body centered in the frame. If necessary, you can remove the leg data from processing.

Max video size: 500 mb

Accepted formats: mpeg4 and mov

3. Select force categories present. Record critical force measurements.

Force Name (Full Body) Example: Pushing cart	Left/ Right/ Both	Value (Measured or Borg – 0-10) & Units (lb or kg)					
		Lift/Lower 	Pull In 	Push Out 	Pull Across 	Pull Down 	Press Down 

Force Name (Hands) Example: Cutting excess wire	Left/Right/Both	Value (Measured or Borg – 0-10) & Units (lb or kg)		
		Pinch Grip 	Finger Press 	Power Grip 

Borg Scale Operator Strength Capability: ☐ Below Average ☐ Average ☐ Above Average

Vibration: ☐ Yes ☐ No

Personal Protective Equipment (PPE)

- ☐ Safety glasses - 0.1 lb
- ☐ Goggles - 0.25 lb
- ☐ Bump cap - 0.5 lb
- ☐ Face shield - 0.5 lb
- ☐ Hard hat - 1 lb
- ☐ Hearing protection - 1 lb

Other:

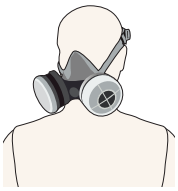
Welding Helmet

- ☐ Light weight - 1.5 lb
- ☐ Heavier - 4 lb
- ☐ PAPR welding - 4 lb
- ☐ Older, very heavy - 5 lb

Other:

Respiratory Protection

- ☐ Particulate mask - 0.1 lb
- ☐ PAPR - 0.5 lb
- ☐ Half-mask - 0.75 lb
- ☐ Full-mask - 1.25 lb
- ☐ SCBA - 1.5 lb
- ☐ Supplied-air - 1.5 lb

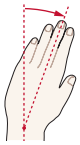


Other:

4. Record hand information.

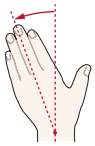
Radial Deviation

- ☐ Left ≥ 20°
- ☐ Right ≥ 20°
- ☐ Both ≥ 20°
- ☐ Duration ≥ 10 sec
- ☐ Frequency ≥ 30/min



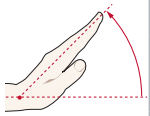
Ulnar Deviation

- ☐ Left ≥ 20°
- ☐ Right ≥ 20°
- ☐ Both ≥ 20°
- ☐ Duration ≥ 10 sec
- ☐ Frequency ≥ 30/min



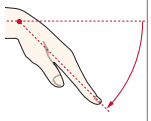
Extended

- ☐ Left ≥ 45°
- ☐ Right ≥ 45°
- ☐ Both ≥ 45°
- ☐ Duration ≥ 10 sec
- ☐ Frequency ≥ 30/min



Flexed

- ☐ Left ≥ 45°
- ☐ Right ≥ 45°
- ☐ Both ≥ 45°
- ☐ Duration ≥ 10 sec
- ☐ Frequency ≥ 30/min



Estimated Forces Borg CR-10 Scale – Operator Instructions

Borg CR-10 Scale Instructions:

Using the rating scale at right, report the number that best represents the level of physical effort exerted in either the hands or arms and in the back when performing the task.

Rating Considerations:

- If your effort level is “Very light,” choose “1.”
- If your effort level is “Moderate,” choose “3.” Note that this level is considered lower than the verbal expressions “medium,” “mean,” or “middle.”
- If your effort level is “Hard,” choose “5.” This level should represent about half of your maximum ability for that body segment.
- If your effort level is “Very hard,” choose a rating from “7” to “9.”

Report what you actually feel, not what you think you should report.

All ratings of perceived exertion should come from a single operator. Rate the individual’s strength or ask them to rate their own strength.

Borg CR-10 Scale Rating of Perceived Exertion	
Rating	**Description**
0	Nothing at all
0.5	Very, very light
1	Very light
2	Light
3	Moderate
4	Somewhat hard
5	Hard
6	
7	Very hard
8	
9	
10	Very, very hard
•	Maximal

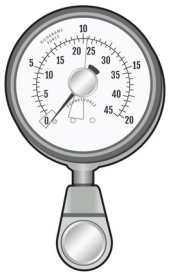
Measured Forces – Force Gauges

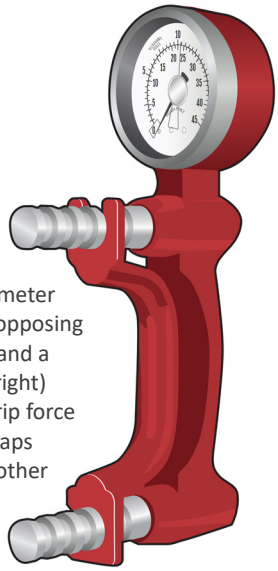
Step 1:
Select the mode and units. Use peak or max mode to measure initial force and tracking, or normal mode to measure sustained force.

Step 2:
Attach the appropriate end piece. Use a large end piece for forces applied by the whole hand, and a small end piece for forces applied by a finger.

Step 3:
Apply the force directly on the item with a steady movement, and in the same direction and orientation as it is performed during the task.

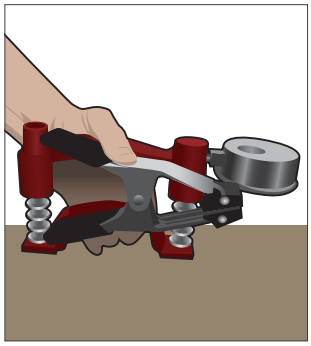
Measured Forces – Dynamometers



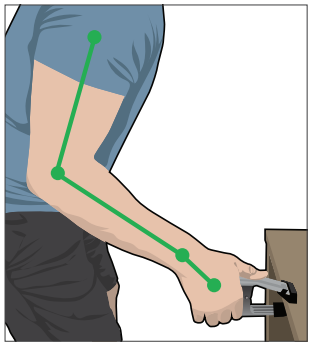


Use a pinch dynamometer (above) to measure opposing forces in the fingers and a grip dynamometer (right) to measure power grip force (when the thumb wraps around to meet the other fingers on the item).

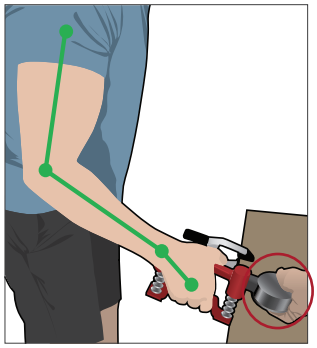
Step 1:
Adjust the dynamometer grip to match tool grip span.



Step 2:
Perform task with tool.



Step 3:
Immediately replicate force with dynamometer.



Manual Material Handling Analysis

Push/Pull Tasks

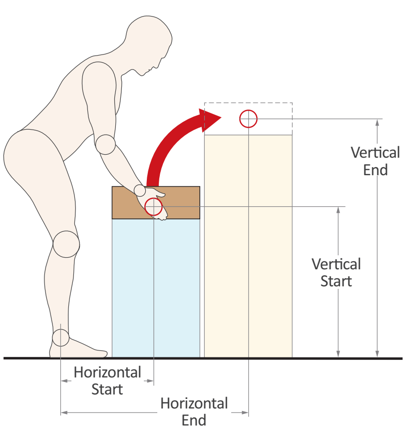
Task Name		Task Name		Task Name	
Initial Force (lb or kg)		Initial Force (lb or kg)		Initial Force (lb or kg)	
Sustained Force (lb or kg)		Sustained Force (lb or kg)		Sustained Force (lb or kg)	
Hand Height (circle)		Hand Height (circle)		Hand Height (circle)	
Chest 53" (135 cm) · Forearm 35" (89 cm) · Thigh 22" (57 cm)		Chest 53" (135 cm) · Forearm 35" (89 cm) · Thigh 22" (57 cm)		Chest 53" (135 cm) · Forearm 35" (89 cm) · Thigh 22" (57 cm)	
Distance (circle)		Distance (circle)		Distance (circle)	
Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)		Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)		Feet: 7 25 50 100 150 200 (Meters: 2.1 7.6 15.2 30.5 45.7 61.0)	
Task Frequency		Task Frequency		Task Frequency	
Every ______ seconds, or Every ______ minute(s)		Every ______ seconds, or Every ______ minute(s)		Every ______ seconds, or Every ______ minute(s)	

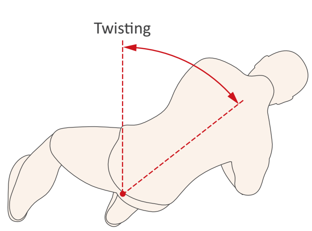
Carry Tasks

Task Name		Task Name		Task Name	
Weight (lb or kg)		Weight (lb or kg)		Weight (lb or kg)	
Hand Height (circle)		Hand Height (circle)		Hand Height (circle)	
Elbow 41" (105 cm) · Hand 28" (72 cm)		Elbow 41" (105 cm) · Hand 28" (72 cm)		Elbow 41" (105 cm) · Hand 28" (72 cm)	
Distance (circle)		Distance (circle)		Distance (circle)	
Feet: 7 14 28 (Meters: 2.1 4.3 8.5)		Feet: 7 14 28 (Meters: 2.1 4.3 8.5)		Feet: 7 14 28 (Meters: 2.1 4.3 8.5)	
Task Frequency		Task Frequency		Task Frequency	
Every ______ seconds, or Every ______ minute(s)		Every ______ seconds, or Every ______ minute(s)		Every ______ seconds, or Every ______ minute(s)	

Lift/Lower Tasks

Task Name			Task Name			Task Name		
Weight (lb or kg)			Weight (lb or kg)			Weight (lb or kg)		
Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)	Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)	Horizontal Distance (in)	Vertical Distance (in)	Twist (degrees)
Start	Start	Start	Start	Start	Start	Start	Start	Start
End	End	End	End	End	End	End	End	End
Grip	Duration (hours)	Frequency (lifts/minute)	Grip	Duration (hours)	Frequency (lifts/minute)	Grip	Duration (hours)	Frequency (lifts/minute)
☐ Good ☐ Fair ☐ Poor			☐ Good ☐ Fair ☐ Poor			☐ Good ☐ Fair ☐ Poor		





Make two measurements, one at the start of the lift and one at the end.

Horizontal:	**Vertical:**	**Twisting:**
from ankle to knuckle on middle finger	from standing surface to knuckle on middle finger	degrees traveled from neutral (0 degrees) in either direction

Workstation Layout

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