

## Analysis of Work Postures Ergonomic Methods

### Static vs. Dynamic Work

- Angular relationship between body parts
- Distribution of masses of body parts
- Forces exerted during posture
- Duration of posture
- Effects on person maintaining posture

### Posture measurement

- Stability of person in posture
- Estimate muscle loads and joint torques
- Estimate fatigue and recovery times
- Hazard assessment

### Posture recording

- Photographic analysis
- Video-motion analysis
- Direct observation methods
  - OWAS (1992)
  - Rapid Upper Limb Assessment - RULA (1993)
  - Rapid Entire Body Assessment – REBA (1998)

### RULA Method (1993)

- focuses on upper limb disorders (ULD)
- analyses posture body segment by body segment

# Rapid Upper Limb Assessment (RULA) Method

## What is RULA

- RULA is a quick survey method for use in ergonomic investigations of workplaces where MSDs are reported.
- RULA is a screening tool that assesses biomechanical and postural loading on the whole body.
- RULA focuses on the neck, trunk and upper limbs, and is ideal for sedentary workers e.g. computer workplaces.
- RULA has been validated on groups of computer users and sewing machine operators.
- RULA is quick and easy to complete.
- RULA scores indicate the level of intervention required to reduce MSD risks.
- RULA compliments other ergonomic methods.

## 1. Observing and selecting the posture(s) to assess

- RULA assesses postural loading at a specific moment in the work cycle. It is important to assess the highest risk posture being adopted. Selecting the appropriate stage of the work cycle for assessment requires some previous observation.
- The highest risk posture for analysis may be chosen based on the duration of the posture (e.g. longest held) or the degree of postural deviation (e.g. worst posture).
- Right or left sides of the body can be assessed independently.
- For long work cycles posture can be assessed at regular intervals.
- When assessments are taken at set intervals over the working period the proportion of time spent in the various postures should also be evaluated.

## 2. Scoring and recording the posture

- Decide on the stage of the work cycle to be assessed
- Decide whether the left, right or both upper arms are to be assessed.
- Score the posture of each body part using the RULA worksheet.
- Review the scoring and make any adjustments if required.
- Use the tables to calculate the grand RULA score.

## 3. Action Level

- Compare the grand RULA score to the Action Level List to determine the risks.
- Review the body segment scores for any undesirable postural deviations that need correction.
- Review possibilities for further ergonomic actions to improve posture where necessary, and thereby reduce risks.
- If changes are made, evaluate their success by performing additional RULA evaluations.

## RULA: Upper Arms

ADD 1 if:

- Shoulder is raised

ADD 1 if:

- Upper arm is abducted

## SUBTRACT 1

- If leaning or supporting the weight of the arm

## RULA: Lower Arms

### ADD 1 if:

- Working across midline of the body
- Working out to the side of the body

## RULA: Wrist posture

### ADD 1 if:

- Wrist is bent away from midline

## RULA: Wrist Twist

- Mainly in mid-range of twist
- At or near end of twisting range

## RULA: Neck

### ADD 1 if:

- Neck is twisting

### ADD 1 if:

- Neck is side-bending

## RULA: Trunk

### ADD 1 if:

- Trunk is twisting

### ADD 1 if:

- Trunk is side-bending

## RULA: Legs

- Legs and feet are well supported and in an evenly balanced posture.
- Legs and feet are NOT well supported and/or NOT in an evenly balanced posture.

## RULA: Muscle Use Score

- RAISE THE SCORE by 1 if the posture is:
  - Mainly static, e.g. held for longer than 1 minute
  - Repeated more than 4 times per minute

## RULA: FORCES or LOAD Score

# RULA Score Sheet

Table A: Upper Limb Posture Score

Table C: Grand Score Table

## OWAS Method (1992)

- records posture (back, arms, legs)
- records force
- records stage of work cycle
- seeks to identify postures where force exertion increases injury risk

## Job Strain Index (JSI)

### JSI Ratings

- Intensity of Exertion
  - Duration of Exertion
  - Efforts per Minute
  - Hand/Wrist Posture
  - Speed of Work
  - Duration of Task per Day
1. Intensity of Exertion
  2. Duration of Exertion
  3. Efforts per Minute
  4. Hand/Wrist Posture
  5. Speed of Work
  6. Duration of Task per Day

Job Strain Index

Job Strain Index Worksheet

Job Strain Index Worksheet Example

Job Strain Index

- Preliminary testing has revealed that jobs associated with distal upper

- extremity disorders had SI Scores greater than 5.
- SI Scores less than or equal to 3 are probably safe.
- SI Scores greater than or equal to 7 are probably hazardous.
- The Strain Index does not consider stresses related to localized mechanical compression. This risk factor should be considered separately.

## JSI: Sensitivity Analysis

### Rapid Entire Body Assessment: (REBA)

REBA: Trunk Score

REBA: Neck Score

REBA: Legs Score

REBA: Upper Arms

REBA: Lower arms

REBA: Wrists

REBA: Scoring

Table A and Load

REBA: Table B and Coupling

REBA: Table C and Activity Score

REBA: Action Levels

Direct measures

- Goniometers
- Electrogoniometers
- Electromyography (EMGs)

Indirect observations

- Video analysis
- Video Motion analysis

Electromyography

- maximum voluntary contraction (MVC)
  - MVC is the muscle activity (force) required to support a maximum load

- constant static effort (>2-3% MVC) is unacceptable

## Subjective methods

- self-reports of effort (Borg scale)
- self-reports of musculoskeletal discomfort
  - body maps (NIOSH diagram)
  - questionnaires (Standardized Nordic questionnaire – SNQ; Dutch questionnaire – DMQ)
- job strain index