

# **StrainAnalysis<sup>©</sup>**

Job Task Analysis for the Prevention of Upper  
Extremity Work Related Musculoskeletal Disorders

By Occupational Health Logic  
[www.ohlogic.com](http://www.ohlogic.com)

# Use of StrainAnalysis<sup>®</sup> for Task Analysis and Ergonomic Remediation

## Example Problem

Responding to a problem with work related upper extremity musculoskeletal disorders occurring in employees performing an assembly task, the safety manager, equipped with a notebook computer running StrainAnalysis<sup>®</sup>, visits the assembly line to perform a task analysis. After observing employees performing the task, and discussing the perceived ergonomic stresses with them, the appropriate data are entered and the Strain Index is calculated:

The screenshot shows the 'Strain Analysis' software window. The title bar reads 'Strain Analysis' with standard window controls. The menu bar includes 'File', 'Edit', 'Jobs', and 'Help'. The main title is 'Strain Analysis' with the subtitle 'Using the Strain Index Equation'. The form contains the following fields:

- Department: Assembly
- Date: 4/4/99
- ID: 184
- Job Title: Assembler
- Analyst: White
- Job Task: Assembling widget

The interface is divided into two main sections:

- Enter task data:**
  - Total Observation Time: 100 : 0 (Min : Sec)
  - Total Effort Time: 36 : 0
  - Efforts Observed: 600
  - Hours per Day: 6
  - Intensity of Effort: Info | Hard (dropdown)
  - Postures: Info | Very Good (dropdown)
  - Speed: Info | Slow (dropdown)
- Program will calculate:**
  - Efforts Per Minute: 6 | Multiplier: 1
  - %Duration of Effort: 36 | Multiplier: 1.5
  - Intensity of Effort Multiplier: 6
  - Posture Multiplier: 1
  - Speed Multiplier: 1
  - Hours per Day Multiplier: 1

The calculated **STRAIN INDEX** is displayed as **9**, which is circled in red. Below the input fields are three buttons: 'Calculate', 'New Task', and 'Browse Database'. At the bottom, there is a status bar with navigation icons and the text 'Record: 8 of 10'.

Strain Index is greater than 5, indicating an ergonomically stressful job task

Seeing that remediation is needed to bring this task into a more acceptable range, the next step is to look at the multipliers to see where changes need to be made. The safety manager and assemblers notice this:

**Strain Analysis**  
Using the Strain Index Equation

Department:  Date:  ID:   
Job Title:  Analyst:   
Job Task:

**Enter task data:**

Total Observation Time:  :   
Min Sec  
Total Effort Time:  :   
Efforts Observed:   
Hours per Day:   
Intensity of Effort:    
Postures:    
Speed:

**Program will calculate:**

Efforts Per Minute:  Multiplier:   
%Duration of Effort:  Multiplier:   
Intensity of Effort Multiplier:   
Posture Multiplier:   
Speed Multiplier:   
Hours per Day Multiplier:

**STRAIN INDEX**

Record: 8 of 10

**Intensity of Effort multiplier is the largest multiplier, and so attention is paid to reducing this one first.**

The “Intensity of Effort” multiplier is a function of the perceived “Intensity of Effort” of the task. Looking again at the data entered for “Intensity of Effort” the team sees this:

**Strain Analysis**  
 File Edit Jobs Help

**Strain Analysis**  
 Using the Strain Index Equation

Department:  Date:  ID:   
 Job Title:  Analyst:   
 Job Task:

Enter task data:		Program will calculate:	
Total Observation Time:	<input type="text" value="100"/> : <input type="text" value="0"/> Min Sec	Efforts Per Minute:	<input type="text" value="6"/> Multiplier: <input type="text" value="1"/>
Total Effort Time:	<input type="text" value="36"/> : <input type="text" value="0"/>	%Duration of Effort:	<input type="text" value="36"/> Multiplier: <input type="text" value="1.5"/>
Efforts Observed:	<input type="text" value="600"/>	Intensity of Effort Multiplier:	<input type="text" value="6"/>
Hours per Day:	<input type="text" value="6"/>	Posture Multiplier:	<input type="text" value="1"/>
Intensity of Effort:	Info <input type="text" value="Hard"/>	Speed Multiplier:	<input type="text" value="1"/>
Postures:	Info <input type="text" value="Very Good"/>	Hours per Day Multiplier:	<input type="text" value="1"/>
Speed:	Info <input type="text" value="Slow"/>		

**STRAIN INDEX**

Record: 8 of 10

**Current task intensity is "Hard."**

The team agrees that the best way to improve the ergonomic characteristics of this task is to concentrate on the "Intensity of Effort." After some discussion and trial and error, changes are made in the work station which result in a decrease in the perceived intensity. The team reviews the choices which are available:

Ergonomic remediation of this tasks begins with consideration of other "Intensity" choices.

The image shows a software interface for Strain Analysis. A dialog box titled "StrainAnalysis: Intensity of Effort" is open, displaying five intensity levels with their descriptions:

- Light: Barely noticeable or relaxed effort
- Somewhat Hard**: Noticeable or definite effort
- Hard: Obvious effort; unchanged facial expression
- Very Hard: Substantial effort; changes facial expression
- Near Maximal: Uses shoulder or trunk to generate force

The main application window shows the following settings and results:

- Hours per Day: 6
- Intensity of Effort: Info Hard (dropdown)
- Postures: Info Very Good (dropdown)
- Speed: Info Slow (dropdown)
- Speed Multiplier: 1
- Hours per Day Multiplier: 1
- STRAIN INDEX: 9
- Buttons: Calculate, New Task, Browse Database
- Status bar: Record: 8 of 10

All agree that while the changes did not make it a light effort task, it is now in the category of "Somewhat Hard." The appropriate button is clicked, and the Strain Index is recalculated.

Now the data appear as follows:

Strain Analysis  
Using the Strain Index Equation

Department: Assembly Date: 4/4/99 ID: 184  
Job Title: Assembler Analyst: White  
Job Task: Assembling widget

**Enter task data:**

Total Observation Time: 100 : 0  
Min Sec  
Total Effort Time: 36 : 0  
Efforts Observed: 600  
Hours per Day: 6  
Intensity of Effort: Info Somewhat Hard  
Postures: Info Very Good  
Speed: Info Slow

**Program will calculate:**

Efforts Per Minute: 6 Multiplier: 1  
%Duration of Effort: 36 Multiplier: 1.5  
Intensity of Effort Multiplier: 3  
Posture Multiplier: 1  
Speed Multiplier: 1  
Hours per Day Multiplier: 1

STRAIN INDEX: 4.5

Calculate New Task Browse Database

Record: 8 of 10

"Intensity of Effort" is changed to "Somewhat Hard" and Strain Index is recalculated.

Strain Index is now 4.5, suggesting a safe task.

This is now a safe task which is unlikely to produce upper extremity work related musculo-skeletal disorders. A report is printed for inclusion in the job description file. The task data are saved to the database simply by moving to a different task or clicking "New Task."

In a few simple steps, and without tedious mathematical calculation, a job task has been evaluated and fixed, with the data saved in hard copy as well as in the computer database, and this was all done at the work station.\*

\*If a laptop or notebook computer is unavailable, the data can be obtained using the worksheet, for entry later on a desktop computer.