

StrainAnalysis[©]

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

By Occupational Health Logic
www.ohlogic.com

Use of StrainAnalysis[®] 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[®], 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:

Strain Analysis

File Edit Jobs Help

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	Efforts Per Minute: 6	Multiplier: 1
Min Sec	%Duration of Effort: 36	Multiplier: 1.5
Total Effort Time: 36 : 0	Intensity of Effort Multiplier: 6	
Efforts Observed: 600	Posture Multiplier: 1	
Hours per Day: 6	Speed Multiplier: 1	
Intensity of Effort: Info Hard	Hours per Day Multiplier: 1	
Postures: Info Very Good	STRAIN INDEX 9	
Speed: Info Slow		

Program will calculate:

Calculate New Task Browse Database

Record: 8 of 10

The screenshot shows the Strain Analysis software window. In the 'Enter task data:' section, 'Total Observation Time' is 100:00, 'Efforts Observed' is 600, and 'Hours per Day' is 6. Under 'Intensity of Effort', 'Info' is selected and 'Hard' is chosen from a dropdown. For 'Postures', 'Info' is selected and 'Very Good' is chosen. Under 'Speed', 'Info' is selected and 'Slow' is chosen. In the 'Program will calculate:' section, 'Efforts Per Minute' is 6, '%Duration of Effort' is 36, and both 'Multiplier' and 'Intensity of Effort Multiplier' are 1.5. 'Posture Multiplier' is 1, 'Speed Multiplier' is 1, and 'Hours per Day Multiplier' is 1. The 'STRAIN INDEX' is displayed as 9, with an arrow pointing to it from a text annotation below. At the bottom, there are 'Calculate', 'New Task', and 'Browse Database' buttons, along with navigation icons and a record counter '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

File Edit Jobs Help

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 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: 6 (circled)

Posture Multiplier: 1

Speed Multiplier: 1

Hours per Day Multiplier: 1

STRAIN INDEX 9

Calculate **New Task** **Browse Database**

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: 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 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: 6

Posture Multiplier: 1

Speed Multiplier: 1

Hours per Day Multiplier: 1

STRAIN INDEX 9

Calculate **New Task** **Browse Database**

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.

StrainAnalysis: Intensity of Effort

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

Program will calculate:

6	Multiplier: 1
36	Multiplier: 1.5
144	Effort Multiplier: 6
576	Multiplier: 1

Hours per Day:

Intensity of Effort:

Postures:

Speed:

Speed Multiplier:

Hours per Day Multiplier:

STRAIN INDEX

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

File Edit Jobs Help

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.