

## A Prospective Study of a Macroergonomics Process over Five Years Demonstrates Significant Prevention of Workers' Compensation Claims Resulting in Projected Savings

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**Abstract.** This prospective study shows the effect of a macroergonomics process on a large government organization of 4500 employees who primarily work at a computer workstation and are relatively “healthy” but often report symptoms to the neck, upper extremities (UE) and/or back. The Worksite International Ergonomics Process® (WIEP) was implemented over a 5 year period from 2009-2013 to address rising repetitive motion injury rates and involves approximately 1550 employees directly. The results show that an early symptom reporting process minimizes workers' compensation claim filing, reduces costs and keeps employees safer, healthier and productive in the work place.

**Keywords.** Macroergonomics, repetitive motion injuries (RMI), early symptoms reporting, Return on Investment (ROI)

### 1. Introduction

The health and productivity (H&P) movement is rapidly advancing worldwide in industrialized companies. In the United States, organizations are concerned about employee lifestyle issues such as stress, obesity and lack of physical activity resulting in increased employee illness, rising medical costs, lost productivity due to unplanned absence and decreased efficiency at work. Managing lifestyle risk factors is a top priority in that employers want to develop a workplace culture where employees are responsible for their health and understand its importance. (Towers Watson, 2014).

Worker health is the “internal temperature gauge” of organizational health. Establishing a culture of health is a top priority and essential for success in reducing absence and costs associated with injury and illness. The National Business Group on Health recently stated that employers who have H&P programs are able to reduce disability days by between 10% and 35%, improve return to work (RTW) rates by at least 6% and experience a return on investment

(ROI) ranging from 3:1 to 15:1. Within six months, many are able to demonstrate reduced lost time, decreased incidence and lower absence rates (Watson Wyatt Worldwide, 2009).

In the USA, workers' compensation and disability costs continue to impact businesses daily. Overexertion injuries including repetitive motion is the most common work-related disabling injury. Many of these injuries when investigated identify co-morbidities of employee obesity, inactivity and workplace stress among other risk factors as contributing to the claim. The estimated direct costs to business in 2005 for overexertion injuries was \$12.7 billion. In 2009, there were 3.2 million overexertion injuries in the United States averaging one per 100 people. Eliminating or controlling repetitive motion injuries is approximated to save a company \$27,700 per case (National Business Group on Health, 2011).

Employers continue to seek ways to engage employees in healthy behaviors. Proactive ergonomics programs focus on addressing workplace risk factors that may cause stress and strain on employees potentially leading to or exacerbating musculoskeletal problems. Using a macroergonomics approach to develop and manage an ergonomics process is one of the most effective ways to proactively prevent, mitigate and manage musculoskeletal injuries and illnesses in the workplace, work-related or not. It will reduce claim frequency, severity and the associated direct and indirect costs (Heller-Ono, 2009).

The goal of macroergonomics is a fully harmonized work system at both the organizational and individual ergonomic level which results in improved productivity, job satisfaction, health and safety and employee commitment; all desirable goals of a H&P program. Macroergonomics is a balanced model where all elements interact around the human to include tasks, organization, environment and tools/technology as shown in Figure 1. When all elements fit



*Figure 1. Macroergonomics is a balanced model where all elements interact around the human.*

together, there is harmony in the workplace; if not, safety, and productivity, efficiency and quality along with employee satisfaction will be impacted (Freivalds, 2005).

The Worksite International Ergonomics Process® (WIEP) is based on the theory of macroergonomics and focuses on the design of the overall work system. It is a lean, proactive, integrated and participative, organizational process that is designed to prevent and manage work injuries as quickly and effectively as possible (Heller-Ono, 2009). With this in mind, is it possible for macroergonomics process to impact health and productivity on a large scale while effectively reducing workers' compensation claims and costs?

## 2. Methods

The WIEP is based on various business theories and ergonomics models that promote efficiency and effectiveness within an organization to “operationalize”

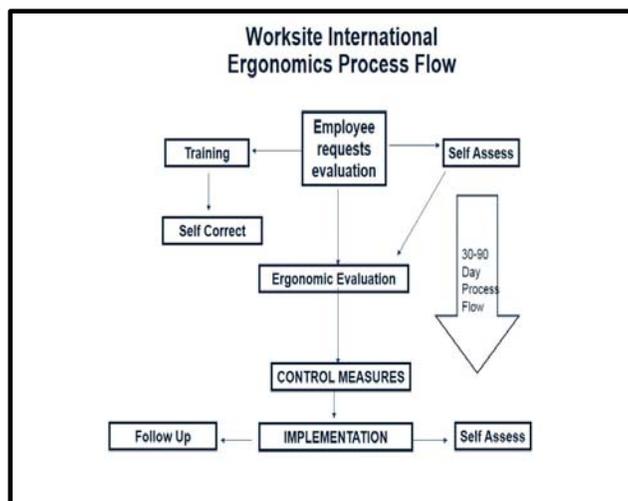


Figure 2. Worksite International Ergonomics Process flow (WIEP®).

ergonomics as part of the routine day to day management of employee health and wellbeing. Already mentioned is Hedrick's model of macroergonomics. Other theories include Noro and Imada's "participatory ergonomics" approach (Noro and Imada, 1991). Quality management and continuous improvement of the WIEP is based on theories proposed by Dr. E. Deming, (Deming, 1986). Lean manufacturing principles which eliminate waste, errors and unnecessary actions and include only those value-added components to enhance the process flow (Liker, 2004) are also included. The WIEP has been utilized and tested in multiple organizations over 18 years by the author with similar results. In this study, the author served as the Ergonomics Manager (EM) and was responsible for implementation of all components of the process. Figure 2 shows a simplified version of the WIEP flow.

### 3. Results

Prior to implementing the WIEP, the organization experienced approximately 438 RMI cases over a five year period at a cost of approximately \$7.6 million. Historically, this claim type was roughly 19% of all claims and 29% of all incurred costs. Results of the WIEP over five years shows a reduction of

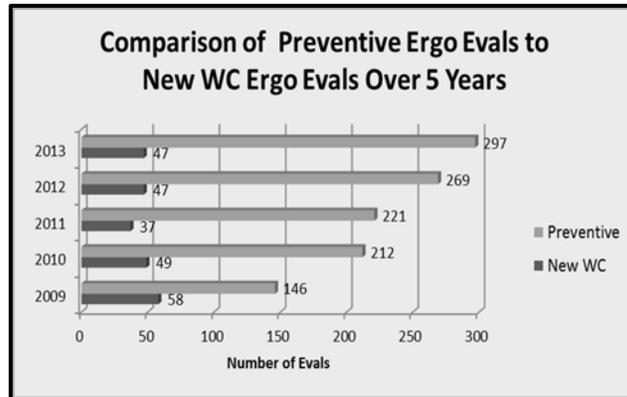


Figure 3. Comparison of preventive ergonomic evaluations to new workers compensation ergo evals over 5 years.

new RMI workers' compensation claims by 45% with 200 less claims filed than in the preceding five years.

Participation in the process is robust and has increased 61% since the first year of the program in 2009 where 232 employees were evaluated (all types) compared to 377 in 2013. Overall, there was a 51% increase in preventive evaluations performed over the same time period while new workers' compensation claims remained relatively constant as shown in Figure 3.

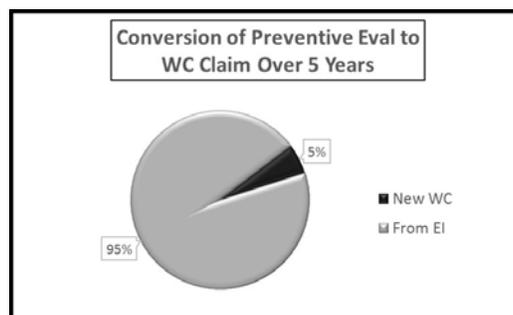


Figure 4. Conversion of preventive ergonomic evaluation to workers' compensation claim over 5 years.

Another important statistic is the conversion rate which measures the number of preventive evaluations (employees with symptoms) that convert to a workers'

compensation claim within two years from the time the last preventive eval was performed. The conversion rate over a five year period was 61cases of 1550 evaluations performed. Figure 4 shows the 5% conversion rate of preventive evals converting to new workers’ compensation claims.

### 3.1 Process Costs

A budget to support the WIEP was prepared every fiscal year. A conservative amount of \$160,000 was estimated for the first year. As participation increased, so did costs. By year five, the investment had increased 34% to approximately \$240,000.00 which covered all preventive and workers’ compensation purchase costs, new chair purchases and all consulting fees for evaluation and training services. Over five years, the investment was \$967,483.00. Based on the total number of evaluations performed over this period (1550), the average investment per person in the process is \$625.00 which includes the evaluation, training participation and all approved purchases.

### 3.2 Return on Investment

Calculating Return on Investment (ROI), sometimes called Rate of Return, is a very common way to help employers understand the value a proposed solution will bring. The calculations are typically straightforward and compares the financial benefits of a proposed solution to its costs. (Budnick, 2012). To determine a ROI for the WIEP, the formula used is defined in Figure 5 with some modifications (Heller-Ono, 2006). Since workers’ compensation claims are categorized as medical only and indemnity with significant variation in cost, the formula is further broken down using Pareto Analysis where 80% of the costs are associated with 20% of the (indemnity) cases. It is projected that had it not been for the WIEP, most preventive evals would have converted to WC claims with 80% going to medical only and approximately 20% to indemnity type claims.

$$\frac{\text{Average company RMI workers' compensation costs per claim} \times \text{\# Preventive evaluations performed}}{\text{Annual investment in the process}}$$

Figure 5. Return on Investment formula.

### 3.3 Projected Savings

<b>Table 1. WIEP ROI Calculations</b>	
WIEP All Years	2009-2013
Total All Cases (WC+ Preventive)	1550
Total All Preventive	1145
Preventive to WC Conversion	61
Number of WC claims prevented - conversion	1084

Med Only (80%) (All Prev. x80%) x \$MO (\$3725.00)	868 X \$MO
Indemnity (20%) (All Prev. x20%) x \$Indemnity (\$55,575.00)	216 X \$Indemnity
Projected \$ Savings in Claims Prevented	\$15,650,946.00
Total program costs (+ EM Salary \$120K/year) over 5 years	\$1,567,483.00

Based on the formula used, an average Return on Investment using the WIEP macroergonomics process is estimated to save the organization approximately \$10.00 for every \$1.00 invested over a five year period.

#### 4. Discussion and Conclusion

The WIEP macroergonomics process described is iterative (design, evaluate, refine, reevaluate, further refine, etc.), nonlinear (does not proceed in a simple sequential manner), and stochastic (requires making inferences or decisions based on incomplete data). This is not a pure process (Hendrick et al, 2001). Obtaining the average cost of claims is difficult and often requires using benchmark data from state or insurance resources. The more real the actual cost figures provided, the more accurate the financial analysis is for the employer (Heller-Ono, 2009). Despite the difficulties one can experience with data of this kind, it is obvious that establishing a macroergonomics process and encouraging participation of employees early by offering ergonomic analysis and training routinely helps to make ergonomics a “keystone habit” where a “small win” helps other habits to flourish driving widespread cultural change (Duhigg, 2012).

It is estimated that over 65-70% of the organization has participated in the ergonomics process by engaging in office ergonomics and back safety training and ergonomic evaluations. Observation of coworkers participating in the WIEP®; hearing their remarks of how much better they felt, leveraging their experience and in turn, encouraging others to participate ultimately drives cultural change resulting in robust individual and organizational benefit and financial savings.

#### References:

1. Deming Edwards, W. (1986). *Out of the Crisis*. MIT Press.
2. Duhigg, C. (2012). *The Power of Habit: Why We Do What We Do In Life and Business*. New York: Random House.
3. Freivalds, A. (2005). *Introduction to Work Design PowerPoint*. Penn State (2005).
4. Heller-Ono, A. (2009). *21<sup>st</sup> Century Ergonomics: A Lean Approach to Ergonomics Process Design and Management*.
5. *Proceedings of the Human Factors and Ergonomics Society 53<sup>rd</sup> Annual Meeting*. San Antonio, TX.
6. Hendrick, H. and Kleiner, B. (2001). *Macroergonomics: An Introduction to Work System Design*. Santa Monica, CA. Human Factors and Ergonomics Society.
7. Liker, J. (2004). *The Toyota Way*. McGraw-Hill.
8. National Business Group on Health (2011). *Fact Sheet: Overexertion Injuries*. May 2011. <http://www.businessgrouphealth.org>.
9. Noro, K. and Imada, A.S. (1991). *Participatory Ergonomics: Methods for Improving Individual and Organizational Effectiveness*. New York: Taylor and Francis.
10. Towers Watson (2014). *2013/2014 Staying@Work U.S. Executive Summary Report*. Retrieved Jan31, 2014 from <http://www.towerswatson.com>.
11. Watson Wyatt Worldwide (2009). *The Health and Productivity Advantage 2009/2010 North American Staying@Work report*. <http://www.towerswatson.com/DownloadMedia.aspx?media={12AC8E91-D884-435D-A7F4-86603314F443}>.