Office Ergonomics Do They Work?

An analysis of the effectiveness of the state of Oregon's office ergonomics initiative

By Tony Brace

AN OFFICE ERGONOMICS INITIATIVE launched in 1995 by the state of Oregon's Dept. of Administrative Services Risk Management Div. (DAS RMD) targeted musculoskeletal disorders (MSDs) among state employees who perform seated office work. Through this initiative, employees received specialized training and equipment designed to minimize awkward postures, forceful exertions and repetitive motions.

To implement the initiative, DAS RMD developed statewide consensus guidelines for office seating and surfaces; provided training on awareness of proper office ergonomics; procured office equipment and furnishings that support the stated expectations; and implemented an ongoing workstation assessor training course.

Under the initiative, each agency independently developed and maintained a site-specific ergonomics program, determined budgets for equipment, and developed internal accountability and follow-up procedures; however, all were required to purchase office seating according to the state's chair contract guidelines. Safety consultants from the state's workers' compensation carrier, SAIF Corp., partnered with state agencies to develop agency-specific ergonomics programs; the carrier's consultants also provided support for ergonomics challenges encountered by agency employees.

The assessor training course was jointly developed by DAS RMD and SAIF Corp., and was designed to teach the state's office workers how to perform ergonomic assessments for coworkers in their respective agencies. This ongoing training course has been taught at least once a month since January 1996. It is not mandatory and is offered free of charge to any state employee who is interested. Attendees include a broad mix of state employees, including agency directors, supervisors and line-level employees. Classes are typically conducted by SAIF consultants, although some agencies deliver their own internal programs based on the training developed by DAS RMD and SAIF Corp.

The classes feature a mix of lecture, video presentation, multiple-choice post-testing and a hands-on practicum during which students perform a mock assessment of a workstation in order to demonstrate proficiency. Topics covered include a definition of MSDs and soft-tissue injuries; human anatomy; MSDs risk factors in the workplace and best practices to combat those factors; taking chair and workstation measurements; and seating and workstation adjustments. The program's content has not significantly changed since its inception.

Students are encouraged to perform three assessments at their respective worksites and to send the assessments to the class instructor. After the instructor has reviewed the assessments, students receive certificates of completion designating them as office ergonomic assessors.

Recently, DAS RMD and SAIF Corp. decided to review the program's efficacy to assess whether the initiative should be continued unchanged, modified or discontinued. The objective of this assessment was to determine whether the frequency and severity of MSD-related workers' compensation claims among state employees who perform seated

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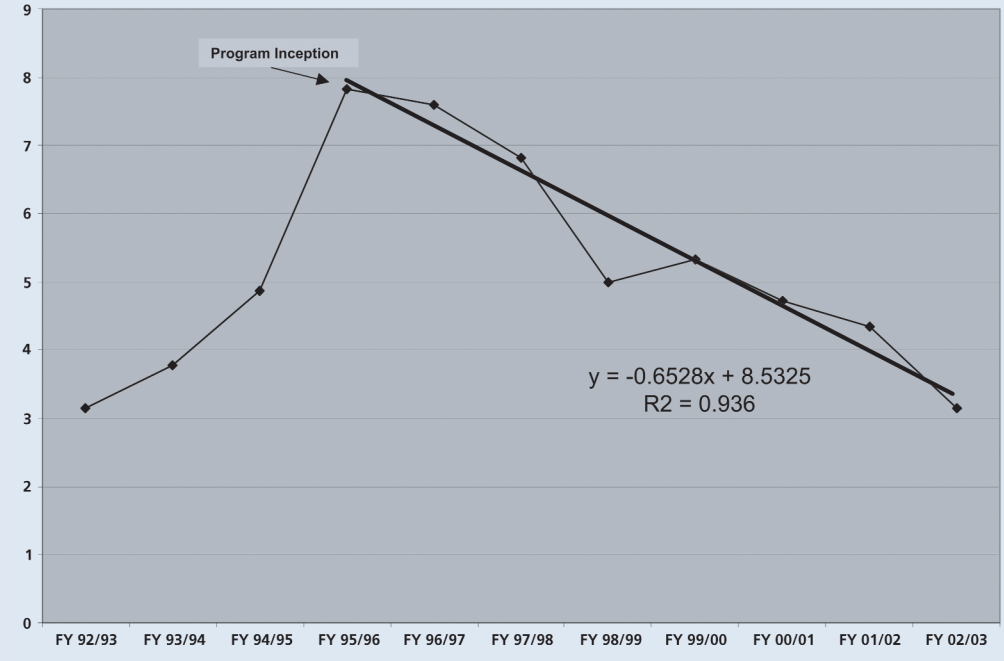
Figure 1

Claims Frequency Per 1,000 FTE



Abstract: *This article examines the effectiveness of an office ergonomics initiative aimed at reducing musculoskeletal disorders (MSDs) among employees who perform seated office work. Workers' compensation claims were evaluated to determine whether the initiative is affecting MSD-related claims among state office workers. Claim frequency per 1,000 full-time equivalent (FTE), annual medical paid costs per 1,000 full-time equivalent, average medical costs per claim and average time loss days per claim were evaluated.*

office work had changed significantly since the initiative was implemented in 1996.

Few published studies have addressed the efficacy of ergonomics programs. Most studies have typically focused on evaluating the link between the type and quality of ergonomics training and MSD prevention. One such study surveyed 170 employees at a petrochemical research company before and after implementation of an ergonomics training program. The survey was used to document any changes in workstation configuration and/or a change in self-reported MSD symptoms. The authors found that employees reported a significant change in head position toward a neutral posture, a change in mouse position, and a reduction in reported symptom severity for the neck, upper back, shoulder and hand/wrist [Lewis, et al(a)].

Another study sought to determine whether there was a difference in traditional ergonomics training methods and self-directed training. Subjects were randomly assigned to a traditional training group, a self-directed training group or a control group that received no training. The authors surveyed subjects after training to assess their ergonomics knowledge and habits. A significant difference was found between the two treatment groups and the control group. Survey results revealed that subjects who received either traditional, lecture-type training or self-directed training reported significantly higher scores in ergonomics knowledge and ergonomics work habits than those in the control group (Rizzo, et al).

Other studies have reported similar results (e.g., Vink and Kompier; Aaras, et al; Tiraboschi, et al; Harrington). The findings of these studies are important as they suggest that ergonomics education among an at-risk population appears to have an effect on increasing knowledge and influencing better work practices among office workers.

However, these studies do not address the financial impacts of training. Only one study found measured the financial costs of ergonomics training and intervention. As a part of Lewis's earlier study of a petrochemical research company, the firm's claims experience records were reviewed to evaluate the effectiveness of ergonomics training from a workers' compensation perspective. Insurance claims between 1990 and 1998 were evaluated according to the frequency of claims, average workers' compensation costs per year and the average claim cost. Ergonomics training was offered in 1995; claims generated from 1995 to 1998 were compared with the baseline period of 1990 to 1994. Not only did the average cost per claim decrease when compared with the pretreatment baseline, but the average injury rate dropped as well after training program implementation. The researchers concluded that the findings were notable given the large increase in computer usage among employees which occurred during the study period [Lewis, et al(b)].

The Assessment Method

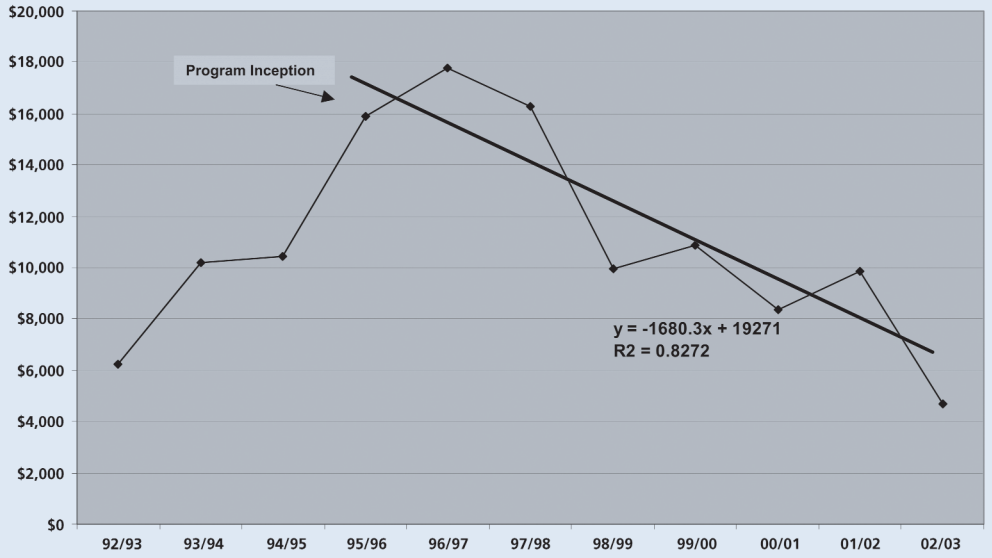
Ten years of workers' compensation claims for Oregon state agencies were reviewed; these reflected all fingertip-to-shoulder claims from fiscal year 1992/93 (FY92/93) to fiscal year 2002/03 (FY02/03). Individual state agency participation in the data set was dependent on attendance records of the ergonomics assessor classes between 1995 and 2003. Agencies that did not participate in the training were excluded from the data set. Law enforcement, healthcare and the university system were also excluded due to a prevalence of fingertip-to-shoulder MSD claims attributable to sources other than seated office work. Agencies included in the data set were social services agencies, state utilities, legal and regulatory agencies (excluding law enforcement), and financial agencies. In all, 18 agencies were included in this study.

The data were further analyzed according to occupation. All nonoffice types of occupations (seated office work less than 25 percent of the time) were excluded from the data set. This included occupations such as food service, custodial, maintenance, mechanical trades and manufacturing. Remaining occupations came from employment in areas such as accounting, clerical, administrative support, auditing, data entry, human resources, information systems, social services, and other types of clerical or professional office-related jobs.

Workers' compensation claims can last for many years and can grow or mature in cost over time. For example, an eight-year-old claim for carpal tunnel

Figure 2

Annual Medical Paid Loss Per 1,000 FTE



can cost eight times as much as the same type of carpal tunnel claim that is only 12 months old. This is because the older claim may involve ongoing treatment costs, whereas the medical treatment has just begun on the more recent claim. As a result, claim maturity can skew data such that newer claims appear to cost less than older claims. To counteract this, all claim data for this study were valuated at 180 days from the date of injury. This means that all claim costs were allowed to mature only to 180 days. This limitation provided a clear snapshot of claim costs by allowing all claims to mature to the same level.

The claim data were analyzed for claim frequency per 1,000 full-time equivalent employees (FTE), annual medical paid loss per 1,000 FTE, average medical paid costs per claim and average time loss days per claim. Medical paid loss was used as a metric because it was considered to be a more stable indicator of the severity of MSD claims. Medical paid loss does not consider factors such as disability payments, time loss payments, awards and other extraneous variables that are not directly related to the medical issue at hand and tend to fluctuate due to differing claims management practices.

Annual state FTE figures from FY92/93 to FY02/03 were obtained from Dept. of Administrative Services payroll for all agencies included in the data set. The average annual total population size for all 18 agencies included was 15,584 plus or minus 498 employees in any given year (n=15,584 ± 498). The raw claim frequency and annual medical paid costs was divided by annual employment figures to determine a rate of MSD fingertip-to-shoulder injuries per 1,000 FTE and medical paid costs per 1,000 FTE. Medical paid losses were adjusted to reflect 2003 dollars based on data from the Consumer Price Index for Medical Care (BLS).

The data for the rate of MSD injuries per 1,000 FTE, annual medical paid loss per 1,000 FTE, average medical cost per claim and average time loss per claim were graphed to display trends in the data.

A repeated measures analysis of variance (ANOVA) with follow-up t-tests and Pearson correlation coefficient were used to analyze the data set from the year the treatment started in FY95/96 to FY02/03 to determine the significance of any trends. Repeated measures ANOVA was chosen due to the ongoing treatment and because different participants, matched on the basis of the variable of interest (a fingertip-to-shoulder MSD claim), are present in each treatment condition. The repeated measures ANOVA was used to sample the population of interest using the population's performance when the treatment began as a benchmark by which all other annual values were compared. The data were analyzed using *SPSS Version 12.* The null hypothesis assumed there would be no statistically significant difference in the frequency of claims per 1,000 FTE, annual medical paid losses per 1,000 FTE, average medical paid costs per claim and average time loss days per claim for the eight-year period from 1995 to 2003.

Assessment Results

Claims Frequency

Claims frequency revealed a rising trend of 3.4 injuries per 1,000 employees in FY92/93 to 7.9 injuries per 1,000 people in FY95/96 when the program started; it also revealed a decline from 7.9 injuries in FY95/96 to 3.1 injuries per 1,000 employees in FY02/03. Claims frequency per 1,000 FTE in 2003 was 61-percent lower than in 1996. Figure 1 shows the significant downward trend from the time treatment began with little variability (R2=0.94). Significance of this downward trend was assessed with a Pearson correlation coefficient. Results indicated the observed downward trend to be significant ($p<0.01$) with a correlation coefficient of -0.967 (r=-0.967) and a high effect size (R2=0.93). From FY95/96 to FY02/03, the number of office ergonomic fingertip-to-shoulder claims has declined significantly.

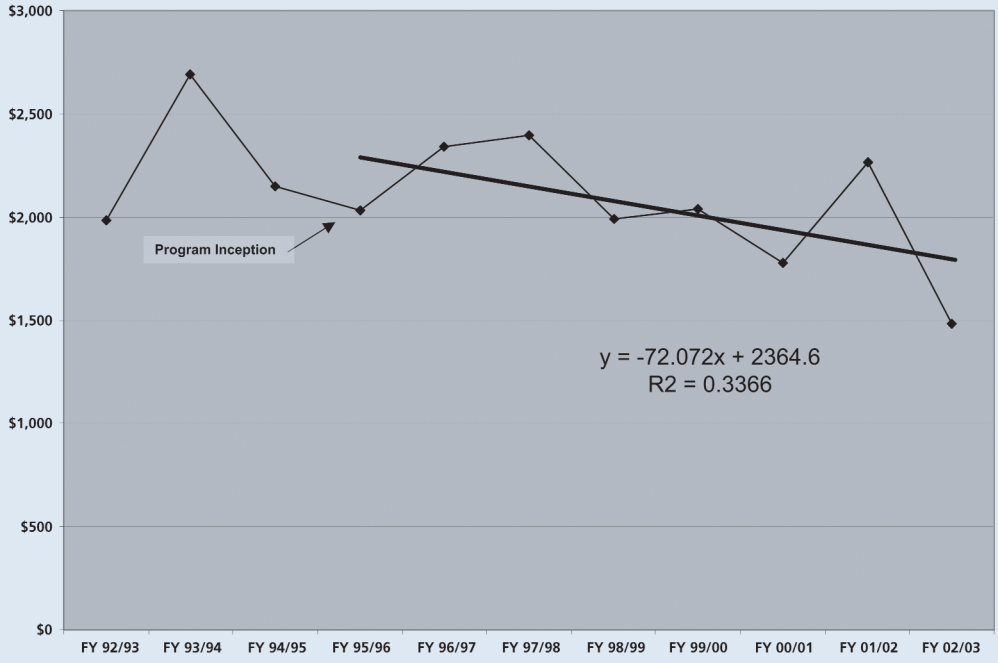
Further significance testing for claims frequency from 1995 to 2003 was determined using a repeated measures ANOVA. Results were significant at a 0.05 alpha level ($F=5.018$, $p=0.002$) with a high effect size of 0.626 (R2=0.626). Follow-up pairwise comparison t-tests with a Holms Sequential Bonferroni adjustment indicate claim filing frequency in FY95/96 was significantly different than claim filing frequency in FY02/03 ($p=0.003$, $p<0.008$)

Medical Paid Loss

Total annual medical paid loss per 1,000 FTE followed a similar trend as total claims frequency (Figure 2). Claim medical paid loss per 1,000 FTE increased from $6,237 per 1,000 FTE in FY92/93 to a peak of $17,786 per 1,000 FTE in FY96/97 at which point it began a steady decline to $4,679 per 1,000

Figure 3

Average Medical Paid Costs Per Claim



Students are encouraged to perform three assessments at their respective worksites. Once those are reviewed, students receive certificates of completion designating them as office ergonomic assessors.

FTE in FY02/03. A linear trend line was added to the graph from the initial treatment year of 1995 to 2003 that indicated a consistent downward trend with low variability. Results of a Pearson correlation indicated the observed downward trend to be significant ($p=0.002$) ($p<0.01$) with a correlation coefficient of -0.910 ($r=-0.910$) and a high effect size ($R2=0.82$). From FY95/96 to FY02/03, the annual medical cost (adjusted for inflation) per 1,000 FTE for office ergonomic fingertip-to-shoulder claims has dropped significantly.

Further significance testing for quarterly medical paid costs from FY95/96 to FY02/03 was performed using repeated measures ANOVA. The results were significant at a 0.05 alpha level ($F=3.569$, $p=0.01$). Follow-up pairwise comparison t-tests indicated that medical paid costs per 1,000 FTE for fiscal years 95/96, 96/97 and 99/00 were significantly different than medical paid costs per 1,000 FTE in FY02/03 (FY95/96, $p=0.05$; FY96/97, $p=0.007$; FY99/00, $p=0.008$, $p<0.05$). However, the possibility of a type one error exists because the significance level, when adjusting for Holm's sequential Bonferroni, drops from 0.05 to 0.001.

Average Medical Paid Costs Per Claim

The average medical paid cost per claim was calculated for each year and a trendline was added the year the initiative began (Figure 3). The average medical cost per claim is highly variable with a slight trend downward. Significance of this trend was assessed with a Pearson correlation coefficient. Results indicate the observed downward trend to be not significant ($r=-0.580$, $p=0.132$, $p>0.05$) with a low effect size ($R2=0.33$). From FY95/96 to FY02/03, the average medical paid costs per claim did not significantly change even though these costs are trending downward. Given the variability and weakness of the trend, a repeated measures ANOVA was determined to be unnecessary.

Time Loss Days

Average time loss days per claim were analyzed (Figure 4). The trendline on this graph indicates high variability ($R2=0.0019$) and no slope to the trend. Given the variability and lack of slope in annual average time loss days per claim, further significance testing was determined to be unnecessary.

Discussion

Claim Frequency/ Medical Paid Loss

A significant difference was found between the number of claims filed the year the initiative began (FY95/96) and the number of claims filed in FY02/03. The significant decrease in the rate of claims filed would suggest that the initiative had a significant effect over the time period studied. These results parallel the findings reported by Lewis, et al, who found a drop in the injury rate among office workers after a training program was implemented [Lewis, et al(b)]. Anecdotally, these results are also notable given the large increase in computer-related work performed by state employees during the last decade.

Annual medical paid loss also declined significantly from the time the ergonomics initiative was implemented, although the significance is weaker than claim frequency. This reduction in annual medical paid costs is likely attributable to fewer claims being filed.

Average Medical Paid Costs Per Claim

The average medical paid costs were found to be trending downward slightly, but not with any significance. The average paid costs per claim each year tend to be highly variable and unpredictable. This would indicate that the severity of an MSD injury, once developed, is roughly at the same level as when the initiative began, although the prevalence of MSD injuries has declined.

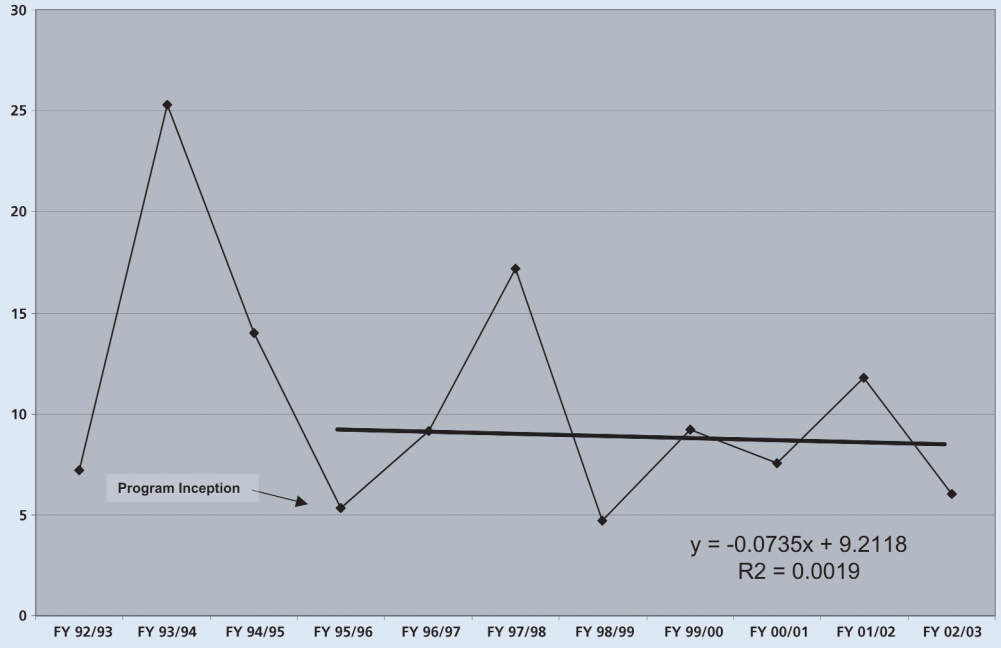
These results are in contrast with the Lewis study, which found that the average cost of claims decreased after ergonomics training. One possible explanation for this discrepancy is that Lewis's study had a small sample size of 273 possible subjects who worked for one employer, whereas the present study had a possible sample size of more than 15,000 subjects and crossed several different employers and management structures, thus increasing statistical power.

A possible explanation for the discrepancy between the decrease in total medical paid loss and the lack of a significant decrease in average medical paid costs per claim may be the fact that those individuals who seek help—either by attending the office ergonomics assessor class or by requesting an assess-

ment—may be preventing the progression of an MSD to a level that requires medical attention. The claims data reflected in the data set may be coming from personnel who are either 1) not aware of ergonomics best practices and/or their options to seek assistance; 2) may be aware yet are resistant to ergonomics modifications to their workspace; or 3) may have health problems that are exacerbated, not caused, by normal office ergonomics risk factors. If employees are not aware of the office ergonomics program and their access to assistance, further promotional and marketing may be needed.

Figure 4

Average Time Loss Days Per Claim



Average Time Loss Per Claim

No positive effects or trends were found in average time loss days per claim. There are several possible explanations for this. Eighteen different agencies were represented in the data set and each agency has different claims management practices. Some agencies are more proactive in assigning injured workers to light-duty jobs while other agencies may not offer such options. Days away from work can significantly increase workers' compensation claims costs.

This may be compounded by the fact that some medical care providers approach musculoskeletal injuries differently. For example, some physicians treat carpal tunnel syndrome by surgical intervention while others prefer to use less-costly and less-invasive physical therapy methods. A final explanation may be that the initiative does not apply a consistent methodology between agencies for controlling time loss days associated with MSD symptoms.

Improvements

Future changes to the initiative may include modifications to the early return-to-work or light-duty job system as it relates to office ergonomics. Other potential improvements include a more intensive and targeted approach with high-risk agencies. This may include development of ergonomics teams that would collaborate with safety and health consultants to develop or revise an agency's ergonomics policy; develop and deliver ergonomics awareness training using both traditional and self-directed methods; ensure consistent early return-to-work policies; and devise methods to further promote best practices and awareness throughout agencies.

Conclusion

This study found a significant decrease in the prevalence and total medical cost of fingertip-to-shoulder MSD injuries likely resulting from seated office work. Although reductions in prevalence were found, reductions in severity were not found. This is evidenced by the lack of a significant change in average medical paid costs and average time loss days over the time period studied. That said, the drop in the prevalence of claims filed and total medical paid costs suggest that the training and subsequent structure of the state of Oregon's office ergonomics initiative may be having a positive effect on the health of employees by providing the knowledge and equipment needed to reduce worker discomfort and pain. ■

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