Evaluating the Effectiveness of an Office Ergonomics Program

By LISA A. TIRABOSCHI, JULIA E. WEISS and MICHAEL B. BLAYNEY

This article describes the evaluation of a program providing ergonomic assessments and individualized training to office and administrative workers. A study questionnaire was mailed to 368 employees after they had received an office ergonomic assessment.

Individuals were asked to provide demographic and employment history information, and to assess whether individual needs were addressed and whether suggested changes were effective. Employees were asked to indicate the level of discomfort they were experiencing prior to the assessment and at the time they were completing the questionnaire.

This study found that employees reported a significant decrease in the level of pain and discomfort they were experiencing after the assessment. Results suggest that evaluating an office ergonomics program from the perspectives of those it is intended to serve can provide important insight into changes that are not otherwise easy to observe or measure.

Traditional definitions of the term "ergonomics" typically include references to the study and measurement of the human body, equipment utilized and environments in which it is used. Today, the term also implies the improvement of the interactions between the human body, objects and the work environment. Ergonomics and the expression "ergonomically designed" have become part of the industry's technical jargon and have shaped expectations as consumers; these terms imply efficiency in design, proper fit and comfort.

The greater awareness of cumulative trauma disorders (CTDs) that has emerged over the past decade has prompted a widening discussion of the causes, management and prevention of musculoskeletal disorders, particularly in the upper extremities (Putz-Anderson). Work-related upper extremity CTDs are a pervasive and expensive problem in the modern workplace (Silverstein, et al 1827). Following the repeal of its original Ergonomics Program Management Standard in March 2001, the U.S. Dept. of Labor is expected to reintroduce some type of ergonomics standard in the future. While such a standard could be potentially expensive, the costs of CTDs in the workplace are borne today in lost productivity, medical and workers' compensation costs, and diminished quality of life. An OSHA standard not withstanding, defining measurable outcomes and effectiveness in the design and delivery of ergonomic interventions is a significant issue.

Implicit in the person/object/environment relationship is the role behavior plays in ensuring proper use and comfort. A claim of "ergonomic design" will not ensure improved use or comfort if behavior has been ignored. Observational measures of behavior in conjunction with verbal and written feedback allow a more-complete picture into what is occurring and why (Wilson and Corlett).

In addition, ergonomic interventions are more likely to succeed when those affected are actively involved in the process—since organizational change is best developed in a participatory way. (Vink, et al 435+; Noro and Imada). It is well known that employees are the most knowledgeable about their work requirements.

BACKGROUND

This article describes a study to evaluate the effectiveness of a program that provided ergonomic assessments and individualized training to office and administrative workers at a four-year college with medical, engineering and business schools. The program had two goals: 1) Alleviate discomfort for those who already were symptomatic for CTDs; and 2) Prevent discomfort among those who were not symptomatic but may have ergonomic-related concerns.

Recognition of an increased incidence of CTDs among the administrative staff led those involved to develop an individualized ergonomic assessment program. Participation was initiated upon request of an employee, supervisor, medical care provider or physical therapist for a worksite assessment. It is important to note that some employees were receiving medical care at the time of the assessment and some as a direct result of the assessment. However, not all employees were in pain or otherwise symptomatic and needed medical care.

Assessments were completed by a representative from the Office of Environmental Health & Safety. A typical worksite assessment consisted of an interview(s) with the employee; discussion of medical concerns (past or present); an evaluation of the work location and tasks using a standardized form; one-on-one instruction; necessary modifications or adjustments to the work area; and follow up. Following the assessment, each employee received a personalized report. Supplemental in-service training sessions were also provided for groups upon request.

The study reviewed here was designed to assess the effectiveness of this program. Evaluation studies are distinguished from research studies in their intent, design and their generalizability (Isaac and Michael). The researchers were specifically interested in the effectiveness of this program from the perspective of those served in terms of needs, means and self-reported outcomes. Thus, no claims are made regarding the generalizability of the findings to other situations due to the inherent limitations of such a study.

MATERIALS & METHODS

A questionnaire and cover letter were mailed in May 1998 to 368 employees who had received an office ergonomic worksite assessment between January 1996 and Spring 1998. Those who did not respond to the initial mailing received a follow-up letter and questionnaire one-month later. Seventy-seven percent of the 368 study-eligible subjects returned the questionnaire (Figure 1).

The questionnaire consisted of categorical and Likert scale items. Demographics, employment history and reasons for assessment were surveyed. Employees were asked whether the assessment had addressed their needs and provided relevant information. Individual written comments were noted at the end of the questionnaire.

Participants were asked to indicate which of the recommended changes, which consisted of equipment or behavioral modifications, were made. Equipment changes could have included a new chair or desk; a change in monitor screen height; addition of a keyboard tray, document holder, footrest, writing board or phone headset; and equipment alignment. Behavioral changes involved posture, hand positioning or taking more breaks.

To assess which type of change was implemented more often, two proportions were created for each employee; the means were then inspected (Conover). Summing over these changes separately and dividing by the number of associated recommendations created each proportion.

Past and present physical discomfort and the level of discomfort/pain employees were experiencing were the focus. Baseline pain levels were not obtained during the assessment and were reported retrospectively on the questionnaire. Employees were not asked to provide information or complete a questionnaire prior to the assessment.

To determine whether a change had occurred in the self-reported presence of physical discomfort before and after the assessment, McNemar's test was used (Conover). This test is applied to paired data to detect a change in the condition of the same subject before and after an event—in this case, the ergonomic assessment. The level of physical discomfort was measured on a scale of zero (none) to 10 (significant). Evidence of improvement in current discomfort levels from the employee's prior pain levels was evaluated using a paired t-test (Wasserman and Kutner). For those experiencing some pain, the relationship between length of employment and prior discomfort was examined using a chi-square test (Wasserman and Kutner).

The questionnaire also asked whether the changes made had been effective and whether employees felt they had the support of their department and/or supervi-

TABLE 1 Subject Characteristics

Characteristic	N	%
Sex		
Male	45	16
Female	239	84
Primary Work		
Faculty	20	7
Secretarial	138	13
Administrative Assistant	54	19
Support Staff	44	16
Data Processor	18	6
Administrative Staff	86	30
Research/Technical	12	4
Research/Administrative	11	4
Length of Employment		
Five years or longer	174	61
Three to five years	56	20
Two years or less	45	16

Note: Numbers do not sum to 284 due to missing values on individual items.

TABLE 2 Frequency and Completion of Recommendations

Recommendation	Frequency of Recommendation		Recommendation Followed	
	N	%*	N	%**
Equipment Changes				
New chair	132	46	112	85
New desk	67	24	44	66
Monitor screen height change	194	68	171	88
Articulating keyboard tray	127	45	99	78
Document holder	46	16	28	61
Footrest	94	33	61	65
Tilt writing board	21	7	12	57
Telephone headset	42	15	27	64
Equipment alignment	101	36	89	88
Other	35	12	29	83
Behavioral Changes				
Postural change	95	33	88	93
Change hand positioning	105	37	97	92
More breaks	55	19	40	73

*denominator=284

**denominator=number of recommendations

sor in assuring that the changes would be made. Finally, employees were asked whether they would recommend a similar worksite assessment to a coworker.

RESULTS

The mean age (_SD) of the 284 respondents was 42 (_10) years; most of the subjects were female (84 percent). Sixty-one percent have worked five years or longer, and 49 percent were employed as administrative staff/assistant (Table 1). More than 60 percent contacted the researchers for an assessment because of some pain. Some 80 percent stated that the assessment addressed their needs and 92 percent stated that it provided them with relevant information.

Of the 184 respondents who requested an assessment due to discomfort, 37 percent had worked for the college at least five years and 63 percent have been employed more than five years. However, no significant association was found between employees experiencing discomfort prior to the assessment and the employee's length of employment at the college ($p=0.32$).

After the assessment, the employee received a written report that outlined advised changes. Table 2 shows the frequency of suggested changes and the number and percent of those recommendations executed. Not every change was proposed for each employee.

As indicated by the recommendations enacted, more behavioral changes actually occurred than equipment changes. Some 86 percent had at least one behavioral change, while 80 percent had at least one equipment change ($p<0.001$).

Employees were asked whether they were experiencing discomfort prior to their assessment and at the time they were completing the questionnaire (Table 3). The percent reporting discomfort decreased from 65 percent to 15 percent following the assessment ($p=0.001$). Two-thirds of those reporting improvement indicated complete alleviation of pain, while the remaining participants indicated that the discomfort was now only occasional.

Respondents were also asked to record on a scale of one to 10 their level of discomfort before and after the assessment. Compared to their former level of pain, a significant improvement in their current level of discomfort was also reported ($p<0.001$). Seventy-eight percent felt that their current level of discomfort had improved; six percent indicated that their discomfort was worse; and 16 percent perceived no change.

Nearly 90 percent reported that their supervisor/department was supportive regarding the assessment. Eighty percent stated that their supervisor/department was supportive in making the recom-

FIGURE 2 EHS Questionnaire

This questionnaire is a follow-up to the Environmental Health & Safety (EHS) worksite assessment you received at Dartmouth College. Please complete this form and return it to EHS, HB 6216 using the enclosed envelope. Thank you for your assistance. The information you provide is kept strictly confidential and is intended to be used as a tool to determine needs for program development.

Gender: 1. Male ____ 2. Female ____ Today's Date ____/____/____
Age ____

A. How would you describe your primary work duties at the time of the assessment? (Check one)

1. Faculty ____
2. Secretarial/Clerical ____
3. Admin. Asst. ____
4. Support Staff ____
5. Data Processor ____
6. Admin. Staff ____
7. Research/Technical ____
8. Research/Admin. ____

B. How long have you currently been employed at Dartmouth College? (Check one)

1. < 3 mos. ____ 2. 3-11mos. ____ 3. 1-2yrs. ____ 4. 3-5yrs. ____ 5. > 5yrs ____

If less than two years, who was your previous employer and what was your occupation?
Employer _____Occupation _____

C. How did you know to contact EHS for an assessment? (Check one)

1. Co-worker ____
2. Supervisor ____
3. Mailing ____
4. Attended Training Session ____
5. Attended Ergonomic Conference on Campus ____
6. Other ____ (Please specify) _____

D. Why did you contact EHS for an assessment? (Check one)

1. Discomfort ____
2. General Information ____
3. Supervisor Requested ____
4. Routine Assessment ____
5. Other ____ (Please specify) _____

E. Has the set-up of your workspace changed since the assessment due to a change in job duties/responsibilities or office location?

1. Yes ____ 2. No ____

F. Did the assessment address your needs?

1. Yes ____ 2. No ____ 3. Somewhat ____

G. Did the assessment provide relevant and sufficient information?

1. Yes ____ 2. No ____ 3. Somewhat ____

H. Were you experiencing discomfort prior to the assessment?

1. Yes ____ 2. No ____ 3. Occasionally ____

I. If yes, what was the level of your discomfort prior to the assessment? (Circle one)

1 2 3 4 5 6 7 8 9 10
Mild discomfort — Discomfort — Significant Pain

J. Are you currently experiencing discomfort?

1. Yes ____ 2. No ____ 3. Occasionally ____

K. If yes, what is the current level of your discomfort? (Circle one)

1	2	3	4	5	6	7	8	9	10
Mild discomfort				Discomfort				Significant Pain	

L. What changes were recommended/made following the assessment?

Recommended			Change Made	
Yes	No		Yes	No
____	____	New Chair	____	____
____	____	New Desk	____	____
____	____	Desk Modification	____	____
____	____	Monitor Screen Height Change	____	____
____	____	Articulating Keyboard Tray	____	____
____	____	Document Holder	____	____
____	____	Footrest	____	____
____	____	Tilt Writing Board	____	____
____	____	Headset	____	____
____	____	Equipment Alignment	____	____
____	____	Postural Changes	____	____
____	____	Hand Positioning	____	____
____	____	More Breaks	____	____
____	____	Other	____	____
_____		Please Specify	_____	
_____			_____	

M. In general, have the changes been effective and improved your work area?

1. Yes ____ 2. No ____ 3. Uncertain ____

N. Are you still waiting for recommendations to be done?

1. Yes ____ 2. No ____ 3. Uncertain ____

O. Was your Department and/or Supervisor supportive/helpful in getting the assessment done?

1. Yes ____ 2. No ____ 3. Somewhat ____

P. Was your Department and/or Supervisor supportive/helpful in making the recommended changes to your work area?

1. Yes ____ 2. No ____ 3. Somewhat ____

Q. Would you recommend a worksite assessment to a co-worker?

1. Yes ____ 2. No ____

R. Please feel free to add any other thoughts you feel may be helpful.

_____

_____

_____

_____

_____

Thank you!
Any questions or concerns?

Contact Lisa Tiraboschi at 646-1762 or via blitz.

Note: Survey has been modified for publication.

mended changes. Only 12 percent said they were still waiting for recommendations to be completed. Ninety-nine percent stated that they would recommend an assessment to a coworker.

As a result of the college's ergonomic assessment program, more than 80 percent of participants felt the assessment was helpful and relevant. When asked whether the changes made to their work areas were effective, 89 percent answered yes.

DISCUSSION

The purpose of this study was to evaluate the effectiveness of a program that provided ergonomic assessments and individualized training to office and administrative workers. Results are similar to other studies that have evaluated the effectiveness of ergonomic interventions in improving worker comfort. These studies have concluded that evaluating the program from the perspective of those it is intended to serve can provide important insight into changes that are not otherwise easy to observe or measure (Vink and Kompier; Aaras, et al; Ekberg). Thus, employee feedback is an essential part in evaluating program effectiveness.

Perhaps the most-useful finding was a decrease in the level of pain and discomfort after the assessment. This result could be from the possible combinations of one-on-one instruction, information, early reporting and recommended behavioral or equipment changes.

However, it is also important to recognize the possibility of a placebo effect on these findings. The term placebo effect is often used synonymously with nonspecific effects. Expectancy of improvement may cause an individual to view the pain problem more positively and as more controllable. Thus, s/he may be more likely to notice small improvements and expectancies may lead to beneficial behavior changes (Turner, et al 1609+).

Medical follow up or treatment may have been an important variable as well. The difference between implementing behavioral changes versus equipment changes may be due to cost, complexity or supervisory approval. This finding may also give insight into how an individual's perception of the need for change plays an important role in ergonomic interventions.

A few individuals reported that they were still waiting for assessment recommendations to be implemented. This was likely due to the time lapse between the assessment and completion of the questionnaire. For some, this was up to two years; for others, it was three to four weeks. Furthermore, not all changes can occur at once.

Supervisors play a key role in ergonomic program success; they must be thoughtful and proactive in addressing

TABLE 3 Self-Reported Prior and Current Experience of Discomfort

Self Assessment of Discomfort	N	%
Discomfort Prior to Assessment		
Yes	184	65
No	36	13
Occasionally	63	22
Discomfort When Completing Questionnaire		
Yes	42	15
No	131	47
Occasionally	109	39
Level of Discomfort Before Assessment (N=247)		
Mild discomfort	56	23
Discomfort	131	53
Significant discomfort	59	24
Level of Discomfort After Assessment (N=151)		
Mild discomfort	72	49
Discomfort	61	42
Significant discomfort	14	9

Note: Numbers do not sum to 284 due to missing values on individual items.

employee concerns. While 80 percent of the study participants' felt that their supervisor/department was supportive, it appears more can be done. In the researchers' opinion, the next logical step in the evolution of this program is to develop a supervisory training component that stresses early reporting and follow through with recommendations. In any program, senior management support is critical. This program has been given visible support at the highest levels.

CONCLUSION

This evaulation study found that employees reported a significant decrease in the level of pain and discomfort they were experiencing after the assessment. Results suggest that evaluating an office ergonomic program from the perspective of those it serves can provide important insights into changes that are not otherwise easy to observe or measure. The positive outcomes from this activity were instrumental in the implemenation of many new initiatives on campus, such as a chair loaner program and an ergonomics web-based training module.

Regardless of whether OSHA eventually promulgates a national standard on ergonomics, the importance of ergonomics programs in the workplace will only continue to increase. Efforts to evaluate the program effectiveness will play a critical role in measuring how successful these interventions are in reducing the prevalence of CTDs in the workplace. ■

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Lisa A. Tiraboschi, *M.S., received an M.S. in Public Health from Boston University in 1992. She has been assistant director of environmental health and safety at Dartmouth College since May 1995. Tiraboschi manages both the ergonomics and biosafety programs for the college.*

Julia E. Weiss, *M.S., holds an M.S. in Bioengineering from Pennsylvania State University. She has been employed as a research associate in the Dartmouth Medical School Community and Family Medicine (Biostatistics) since September 1992. Weiss also holds an M.S. in Physics from the University of Cincinnati.*

Michael B. Blayney, *Ph.D., is director of environmental health and safety at Dartmouth College. Prior to joining the Dartmouth staff, he worked in the Div. of Safety at the National Institutes of Health in Bethesda, MD. Blayney is a member of the ASSE's Greater Boston Chapter.*