Alternative Workstations May Be New But Are They Better?

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Abstract. An ergonomics survey of 84 employees who moved to an alternative workspace with smaller workstations equipped with various ergonomic products is reported. Half of the employees received some ergonomics training. Results showed that 25-40% reported the ergonomic products were somewhat or much less comfortable to use, and around the same proportion found them somewhat or much more comfortable to use. Between 25-40% of employees reported frequent neck, shoulder, back and right wrist discomfort and many reported that these symptoms interfered with work activities. There was clear evidence that levels of discomfort increased over the course of the work day. Employees were equally split on whether the office changes helped or hindered their work productivity. Comparison of the trained versus untrained employees showed that training reduced the problems associated with their new workstations. Overall, the results suggest that ergonomic products alone may not compensate for problems associated with smaller workstations.

Keywords: ergonomics training, alternative workspaces, musculoskeletal injuries, keyboard tray, ergonomic chair, productivity.

1 Introduction

In the U.S.A. a majority of office workers sit in cubicle workspaces (cubes). The size of these cubes often was a function of the size of the computer technology that had to be accommodated, for example, the depth of the horizontal work surface needed to be sufficient to accommodate a desktop, conventional CRT, keyboard and mouse, and a deep corner location was needed to accommodate the depth of a large CRT displays. But those technology requirements have changed. Recently, computer technology has becomes smaller: thin-screen LCDs have replaced CRTs, small form factor desktops have replaced towers, notebooks and netbooks have replaced desktops altogether and keyboards have become sleeker. Smaller technology footprints along with wireless networks have allowed workers to become more mobile. Smaller desktop and laptop computer form factors, reductions in paper storage requirements and a desire for increased spatial variety and flexibility are some of the factors leading many companies to experiment with alternative workplace strategies. Invariably the most obvious impact for employees is a smaller spatial workstation footprint. To compensate for any possible

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adverse effects of reducing workspace, increasing emphasis is being placed on the use of ergonomic products, chairs, keyboards and mice, keyboard trays, task lights etc.

A walk around a U.S. office typically reveals around 50% of cubes are empty because their occupants are elsewhere, e.g., in meetings, traveling or working elsewhere in the building etc. Organizations are responding to these changes by testing alternative workplace strategies that provide smaller cubes, more flexible furniture and a greater variety of types of spaces where work can be done. However, as the cube shrinks there is a need to focus on ergonomic designs to comfortably accommodate the diversity of workers. Often it is assumed that merely giving workers ergonomically designed products is a sufficient strategy, however, providing appropriate ergonomics training can also be a requirement for success.

Korunka et al. (2010) investigated how the successful implementation of an ergonomics program was affected by job, organizational and personal factors for 116 employees in a production company. Results showed that psycho-social resistance attitudes and management support were the most important predictors of the number of ergonomic measures successfully implemented, whereas job, organizational and personal factors accounted for only 35% of the learning transfer variance in the implementation of ergonomic measures. Of importance is the finding that ergonomics training resulted in the implementation of ergonomic measures to decrease injury risks.

Other studies of office workplaces have found that ergonomics training can improve the adjustment and set-up of the workstation and the worker's posture which results in a decrease in reports of musculoskeletal discomfort. Brisson et al. (1999) studied 627 University computer workers who worked >5 hours per day at a computer. Workers were randomly assigned to a training (284 workers) or reference (343 workers) group. Measures were taken in parallel in both groups 2 weeks before and 6 months after the training. The effect of the ergonomics training program on 3 postural stressors (twisted neck, inappropriate screen height and bent hand-wrist line), workstation adjustments and musculoskeletal disorders was tested. The prevalence of all 3 of the postural stressors decreased for those receiving the training whereas 2 of the 3 stressors decreased slightly in the reference group, and this benefit of training was especially pronounced for workers <40 years old.

The effect of an intensive ergonomic approach and education on workstation changes and musculoskeletal was evaluated in a study of 124 video display unit workers were assigned to each of 3 groups: intensive ergonomics, ergonomic education, reference (Ketola, et al., 2002). Evaluation measures (questionnaire, discomfort diary, workload measurement, and workstation ergonomics rating) were made 2 weeks before the intervention and after 2 and 10 months of follow-up. Starting at 2 months of follow-up there was less shoulder, neck, and upper back musculoskeletal discomfort in the intensive ergonomics and ergonomics education groups than the reference group.

Martimo et al., (2010) investigated the effectiveness of an ergonomic intervention at the worksite on lost productivity (decreased quality and quantity of the daily work output) among workers with medically verified upper-extremity disorders (UED). Differences were tested at baseline and 8 and 12 weeks post-intervention for 177 employees randomly allocated to intervention and control groups. Results showed that at baseline, 54% of the intervention group and 58% of the control group reported a productivity loss of 17% and 20%, respectively. At 8 weeks both the proportion and magnitude of productivity loss trended lower in the intervention group, and at 12 weeks the differences were statistically significant (proportion 25% versus 51%, magnitude 7% versus 18%, P=0.001 for both). However, the intervention only benefitted employees with 0–20% loss of productivity at baseline, not those with a higher initial productivity loss.

Solidaki et al., (2010) conducted a cross-sectional survey of 224 nurses, 200 office workers and 140 postal clerks in Crete, Greece to study the relative importance of work-related and psychological determinants of the number of anatomical sites affected by musculoskeletal pain in six body regions (low-back, neck, shoulder, elbow, wrist–hand, and knee). Two-thirds of the sample reported pain in ≥ 2 body sites during the past 12 months, and 23%, >3 body sites. The number of painful anatomical sites was strongly related to the physical work load and work-related psychosocial factors; somatization was the leading determinant of the number of painful body sites.

Robertson et al. (2009) examined the effects of office ergonomics training in a large-scale field intervention study. The ergonomics training accompanied the provision of a highly adjustable ergonomic task chair and the training also provided workers with information on work-related musculoskeletal risks. Three study groups of office workers were compared. One group received both the training and the ergonomic adjustable chair, one group only received the ergonomics training, and one group served as a control receiving neither training nor the chair. Office worker ergonomics knowledge both pre/post-intervention was tested and body postures and workstation set-ups were observed before and after the intervention. Compared to workers in the control group both intervention groups reported higher perceived control over their workspace and greater overall ergonomic knowledge. Post-intervention musculoskeletal risks and work postures were improved for both intervention groups compared with the control group.

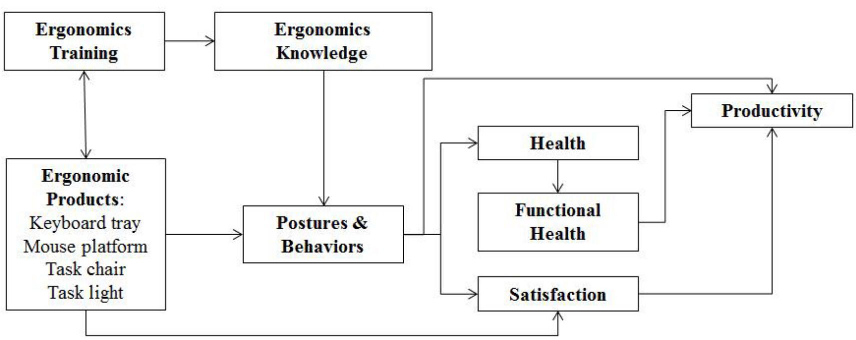

Fig. 1. Model of change as a result of an ergonomics intervention with products and training (adapted from Robertson et al., 2009)

This study extends previous work and tests the effects of a complete workstation makeover for a group of employees moving from conventional office cubes to an alternative workstation design on the levels of musculoskeletal discomfort and the opinions of workers before and after moving. Around 60% of the employees received some ergonomic training in additional to their ergonomic products. The model of change underpinning this work is shown in Figure 1 and was adapted from Robertson et al. (2009).

2 Method

2.1 Survey Sample

A sample of 300 office engineering employees in a large energy company participated in the study and complete data was obtained for 84 respondents (28% response rate). Forty of the respondents (47.6%) reported having attended the company's "ergonomics awareness for office workers annual training" and 9 (10.7%) reported having attended ergonomics training provided by the vendor. Forty one percent reported that they had not received any ergonomics training.

2.2 Survey Method

A retrospective web-based ergonomics survey that asked employees about comparative reactions to their new workstation cubes, the ergonomics equipment, ergonomics training, workspace conditions, opinions and levels of musculoskeletal discomfort in the new versus old workplaces was conducted. The research was approved by the Cornell University Institutional Review Board for Human Participants.

2.3 Alternative Workspace and Ergonomic Design Intervention

The new office workspace design provided employees with a smaller cube footprint. Corner work locations and straight-edge work surfaces were replaced with contoured and linear work surfaces. In an attempt to compensate for the smaller size all cubes in the new office were equipped with a height-adjustable downward tilt keyboard tray with mouse platform; a new ergonomic task chair and most also had an adjustable task light, and other ergonomic accessories, such as a footrest or document holder, were provided as required. Examples of the pre-move and post-move cubes are shown in Figures 2 and 3 respectively.

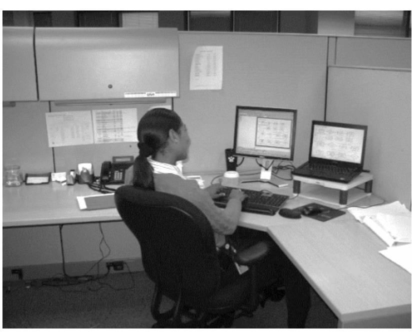

Fig. 2. A pre-move workspace cube

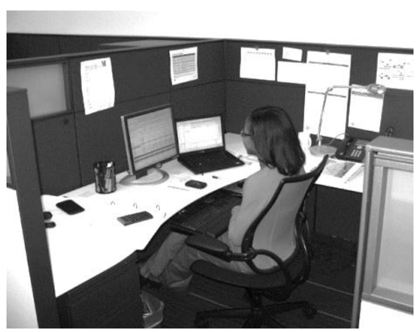

Fig. 3. A post-move workspace cube

3 Results

In this summary of the results all percentages are for the respondents who answered that question.

3.1 Workstation Components

Figure 4 shows employees ratings of their new workstations compared with their previous workstations. Responses were about equally split between those reporting that the new components were somewhat/much more comfortable or somewhat/much less comfortable.

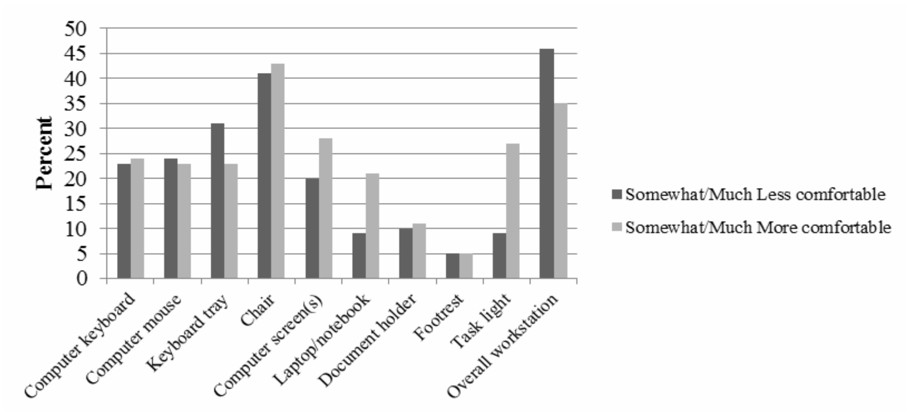

Fig. 4. Comparative ratings of old and new workstations

3.2 Postural Comfort

Figure 5 shows changes in the prevalence of musculoskeletal discomfort during a typical work week for the new and old offices. Neck, shoulder and lower back symptoms were the most prevalent and were more prevalent in the new cubes.

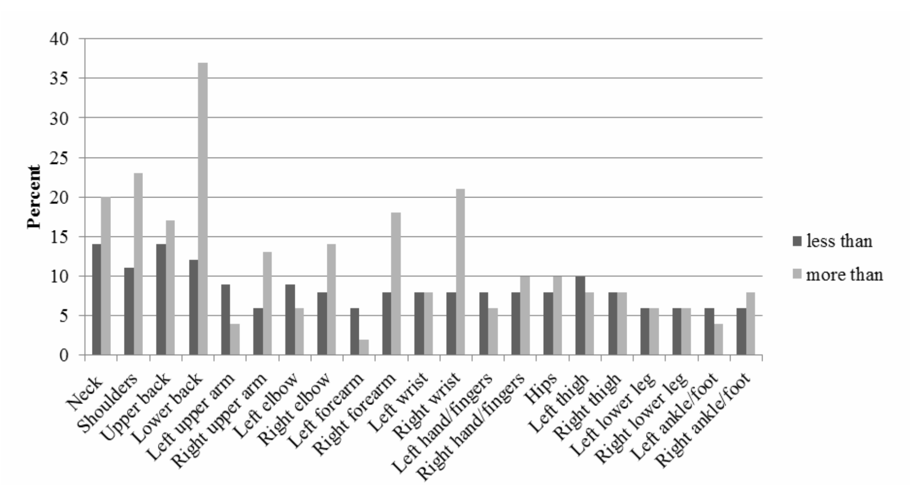

Fig. 5. Changes in the prevalence of musculoskeletal discomfort for the old and new offices

3.3 Work Interference and Musculoskeletal Discomfort

Figure 6 shows the extent to which musculoskeletal discomfort interfered with work in the new cubes: again neck, shoulders and back problems caused problems.

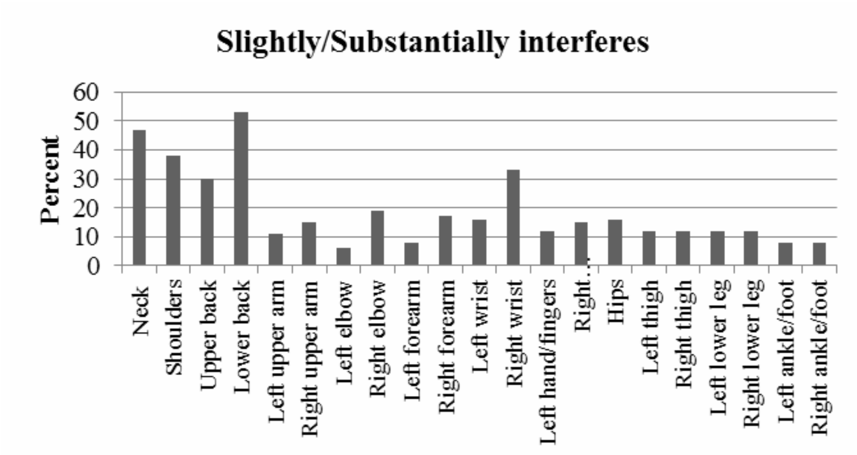

Fig. 6. Work interference effects from musculoskeletal discomfort

3.4 Time-of-Day Effects

Figure 7 shows how the pattern of musculoskeletal discomfort worsened over the course of the work day in the new cubes.

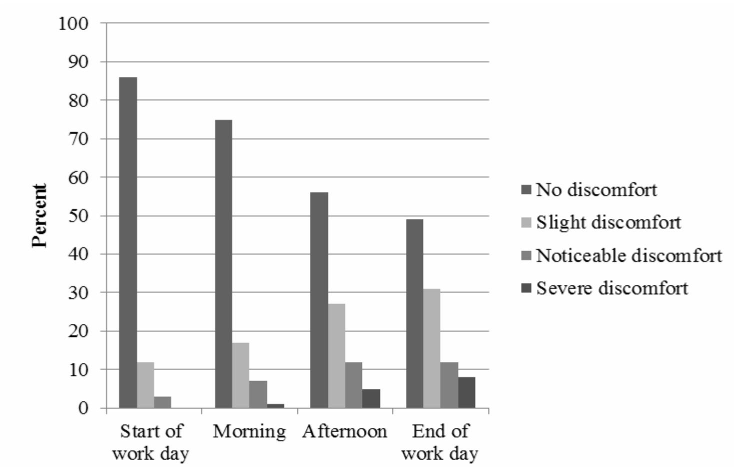

Fig. 7. Time-of-day effects on musculoskeletal discomfort for the new offices

3.5 Workstation Components and Productivity

Figure 8 shows the impact of workstation components on self-reported work productivity.

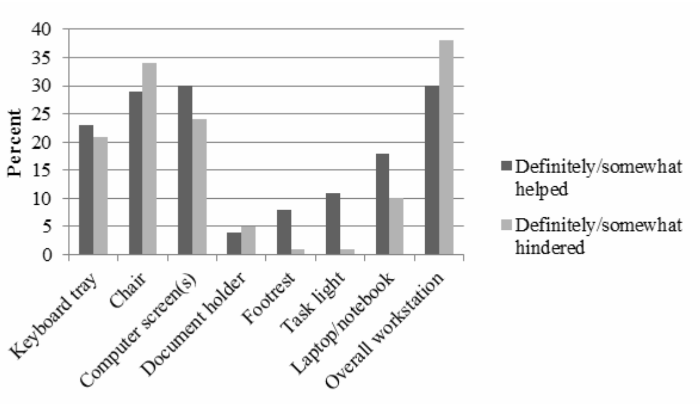

Fig. 8. Effect of workstation components on productivity for the new offices

3.6 Effect of Ergonomics Training on Musculoskeletal Discomfort

Figure 9 shows the effects of training on reports of musculoskeletal discomfort.

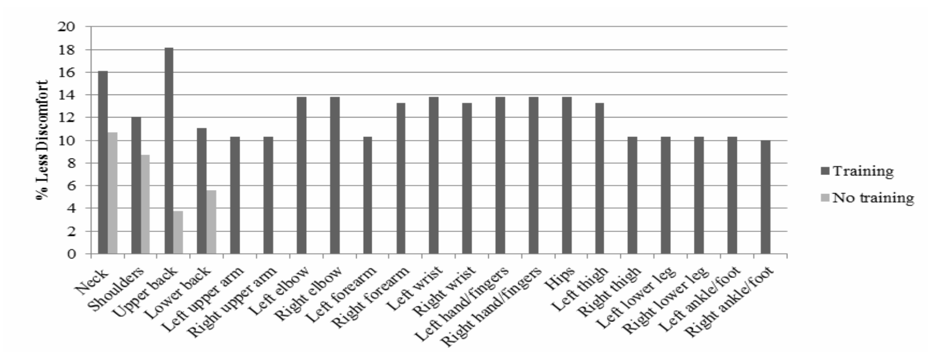

Fig. 9. Effect of training on reports of musculoskeletal discomfort for the new offices

3.7 Effect of Ergonomics Training on Time-of-Day Discomfort

Figure 10 shows the beneficial effect of ergonomics training on reports of musculoskeletal discomfort over the course of a work day.

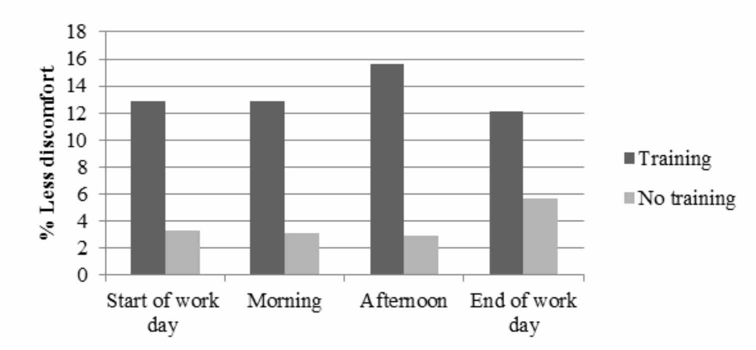

Fig. 10. Effect of training on musculoskeletal discomfort

3.8 Effects of Ergonomics Training on Productivity

Comparisons showed a higher percentage of reports of improved productivity associated with the keyboard tray, chair and computer screen among the trained respondents as shown in Figure 11. Training improved the benefits associated with using the ergonomic products (keyboard tray, chair and computer screen) but fif not affect the impact of the overall workstation.

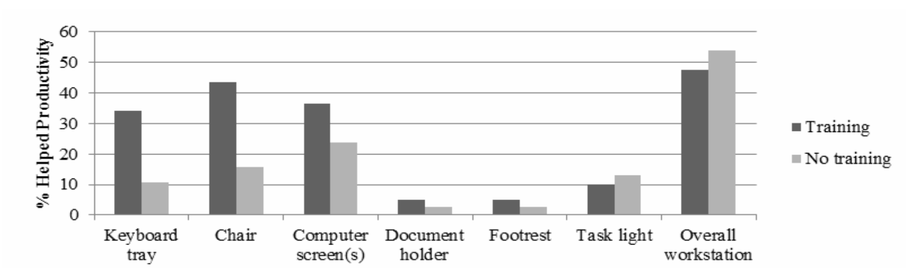

Fig. 11. Effect of training on musculoskeletal discomfort

4 Conclusions

There was an expectation that any adverse effects of moving employees from larger to smaller alternative workstation cubes would be offset by providing them with ergonomic products, whether or not they received adequate training on the adjustment and use of these products. This study clearly refutes that assumption. Following the move to the new offices the employees were consistently evenly split on whether their new workstation helped or hindered their work and their musculoskeletal experiences. Problems of discomfort were shown to increase over the course of the work day. Over half of the employees received some ergonomics training and comparison of those who had and had not received training showed a clear benefit of training in lowering levels of discomfort and improving work productivity associated with the various workstation components. Results from this study are consistent with previous studies that have demonstrated the benefits of ergonomics training (Brisson et al., 1999; Ketola et al., 2002; Korunka et al., 2010; Robertson et al., 2009; Solidaki et al., 2010).

Even though the findings are comparable to the previous studies cited this work suffered unavoidable limitations. This was a retrospective survey of employee experiences of their pre-move and post-move workstations and it was not possible to survey employees prior to their move, nor was it possible to study a control group of comparable employees.

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