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Effects of an ergonomic intervention on psychosocial outcomes

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EFFECTS OF AN ERGONOMIC INTERVENTION
ON PSYCHOSOCIAL OUTCOMES

A Thesis

Presented to

The Faculty of the Department of Psychology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Emily C. Sung

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ABSTRACT

EFFECTS OF AN ERGONOMIC INTERVENTION ON PSYCHOSOCIAL OUTCOMES

by Emily C. Sung

Past research shows that ergonomics plays a significant role in increasing physical comfort. There is also support for theories that profess the enhancement of job performance. This study was conducted to further confirm the effects of ergonomic changes on physical comfort and performance in an office environment. In addition, this study also examined the effects of ergonomic interventions on psychosocial variables such as organizational commitment, perceived organizational support, and turnover intentions. Results of this experiment indicate that changes to chair, keyboard, and monitor height related to higher levels of physical comfort, organizational commitment, perceived organizational support, performance, and turnover intentions. However, of these results, only physical comfort reached statistical significance. More information about these relationships between ergonomics and psychosocial variables can help revolutionize the way employers approach health and wellness programs. Recommendations for future studies are also discussed.

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I would like to extend a special “thank you” to my father, Patrick Fong, whom I love more than words could ever express. Dad, thank you for supporting me through all of my endeavors. I have always been able to depend on you. Your love has provided me with stability during the hard times. Your support has provided me with the courage to try new things. Your guidance has provided me with direction when I’ve felt lost. You have taught me values like integrity, honesty, and fairness. You have been the biggest influence in my life. Thank you for all that you have given me. I love you so much!

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Effects of an Ergonomic Intervention on Psychosocial Outcomes

Ergonomics is the study of human-machine systems (Armstrong, 1986) and has been recently growing in popularity due to the rising costs of injuries in the workplace. The term “Ergonomics” is the Greek term for “laws of work” (May & Schwoerer, 1994). The Department of Labor Bureau of Labor Statistics shows us that in 1990, 56% of all occupational injuries consisted of Cumulative Trauma Disorders (CTDs), up from 18% in 1981. CTDs are a class of musculoskeletal disorders involving damage to the tendons or tendon sheaths, related bones, muscles, and nerves of the hands, wrists, elbows, shoulders, neck, and back (Armstrong, 1986; Labar, 1992). The most commonly reported injuries are those in the upper extremities (Armstrong, 1986). Research has shown that factors such as repetitive movements, force, mechanical stress, posture, vibration, temperature, and static contractions can all lead to injuries (Armstrong, 1986; Grandjean, 1982). While these injuries have traditionally been associated with industries such as meat packing or assembly line work, the increase of computer usage has generated a new risk of injury for the office environment. The purpose of this study is to examine the impact of ergonomic changes on physical and psychosocial outcomes in an office environment where keyboard and mouse use are the main tools for work.

Evaluation of Research

Comfort. Past research has shown that ergonomics plays an important role in increasing comfort and minimizing physical strain on specific body parts (Grandjean, 1982; Armstrong, 1986; Labar, 1992; May & Schwoerer, 1994). Discomfort is the most widely measured consequence from previous studies. Wallace and Buckle (1987) and Aaras,

Westgaard, and Stranden (1988) showed that daily exposure to static muscle contraction over a long period of time may result in discomfort as well as aches and pains in the muscles, joints, tendons, and other soft tissues. In a study conducted by Genaidy and Karwowski (1993), various body parts were measured on college students for comfort levels as posture was observed in deviated positions. The findings showed that the neck and elbow areas showed the highest level of strain when exposed to deviated positions. Interestingly, the elbow and the neck are also two common areas of the body exposed to repeated postural deviation while working on the computer. According to Armstrong (1986), "posture probably is the most frequently cited risk factor of occupational cumulative trauma disorders" (p.559). The focus of each of these studies has been on the industrial environment, ranging from poultry processing plants to electronics firms.

Additional research shows us that there has also been an increase in musculoskeletal illness for video display unit (VDU) operators than non-VDU operators (Bergquist, 1993; Hagberg & Wegman, 1987; Ong, Hoong, & Phoon, 1981). In a study conducted by Aaras, Horgen, Bjorset, Ro, and Thoresen (1998), an ergonomic intervention was implemented for VDU operators. The intervention consisted of installing new tables and chairs, installing height adjustable workspaces, and providing concave shaped desks which gave support of the forearm and room for the operator's trunk. This intervention was implemented for two groups. A third group also participated as a Control group and received no ergonomic changes to their work environment. Results of the study showed that two years after the intervention, the two groups receiving the

ergonomic intervention showed a significant reduction of shoulder pain and trapezius load while the control group showed no such reduction.

Performance. Performance in terms of qualitative and quantitative output is important to any business. Webster's Ninth New Collegiate Dictionary (1986) defines performance as something accomplished. A few studies have been done to suggest that ergonomic programs have positive outcomes, including great productivity (Labar, 1992; May & Schwoerer, 1994). May and Schwoerer's study was conducted in a large Midwest meat-packing organization to see whether ergonomic redesigns of jobs resulted in changes to physical symptoms and changes in productivity. Five teams of seven to nine people were established to implement the ergonomic redesigns. Surveys were used to track self reported pain symptoms and productivity. Ergonomic redesign included adjusting workstation heights to reduce bending, designing conveyer systems to eliminate lifting and transporting products, redesigning tool handles to improve wrist position, developing knee pedals to reduce bending to operate equipment, and providing floor mats to reduce fatigue from standing all day. The results of this study not only showed a decrease in rates of Cumulative Trauma Disorders, but also an increase in team performance. Teams that implemented the fewest number of ergonomic changes reported the lowest ratings of team performance while teams that implemented the most ergonomic changes reported the greatest ratings of performance.

Research in these areas is valuable because it gives the industry a systematic way to battle the rates and costs of work-related injuries and increase worker performance.

Yet this is only the tip of the iceberg. There are many other unexplored effects that have yet to be examined as it relates to ergonomics.

Research Needs

There are still no published articles found to show the direct relationship between ergonomics and other psychosocial outcomes such as organizational commitment, perceived organizational support, or turnover intentions. There has been substantial research conducted on how other variables (e.g. salaries) impact organizational commitment or perceived organizational support. However, no studies look at the direct impact of ergonomics on these variables. Studying these variables as they relate to ergonomics would give employers another way to improve the environment for their most valuable asset, the human resource, and to retain good employees. Each of these variables has its own value for why they should be studied in relation to ergonomics.

Organizational Commitment. Organizational commitment is the “relative strength of an individual’s identification with and involvement in a particular organization” (Porter, Crampon, & Smith, 1976, p.226). The level of organizational commitment is characterized by at least three factors: the strong belief in and acceptance of the organization’s goals and values, the willingness to exert considerable effort on behalf of the organization, and the strong desire to maintain membership in the organization (Mowday, Steers, & Porter, 1979). One facet of commitment is Affective Commitment (Meyer & Allen, 1984). Affective commitment is the emotional commitment a person has toward an organization. In a study conducted by Angle and Lawson (1993), 232 participants were asked to fill out a survey once after relocating to a different office 1,000

miles away and then again two years later. The goal of the survey was to examine the effects of commitment as a result of the relocation. In this particular example, the other aspects of commitment (continuance and normative) were not evaluated since they are not hypothesized to relate as closely to ergonomics. The results showed that 18% of the variance between the results of survey at time 1 and the survey at time 2 was due to aspects of affective commitment. Specifically, the variance was contributed to categories that were labeled: work, non-work, innovation, and pay-offs. The concept of pay-offs was defined as the “evaluation of rewards associated with having relocated” (p. 9).

In a similar way, the goal of this experiment is to apply this concept of “pay-offs” to ergonomics in the office environment rather than to a relocation. The hypothesis is that as ergonomic interventions are implemented, employees will view the intervention as a kind of “pay-off” and their level of organizational commitment will be increased. Understanding the relationship between ergonomics and organizational commitment can provide employers with information on how they can achieve greater levels of commitment from their employees and strive to be a more cohesive and powerful organization.

Perceived Organizational Support. According to Shore and Tetrick (1991), perceived organizational support is where “an employee’s inferences about the organization’s commitment to him or her contributes to the employee’s subsequent commitment to the organization” (p. 637). Past research has focused primarily on how perceived organizational support can have a positive impact on organizational commitment and turnover. In other words, having increased perceived organizational

support leads to increased organizational commitment as well as decreased turnover (Eisenberger, Huntington, Hutchison, & Sowa, 1986). Social exchange theory (Eisenberger et al., 1986) suggests that an employee's perception about an organization's commitment to him/her contributes to the employee's future commitment to the organization (Shore & Tetrick, 1991).

While past research has predominantly focused on the effects of perceived organizational support on other outcomes such as organizational commitment or turnover, this study intends to examine the effects of ergonomic interventions directly on perceived organizational support. Using Shore and Tetrick's definition of Social Exchange Theory, some intervention that can enhance an employee's perception of their employer should lead to higher perceived organizational support. Based upon this relationship, one could predict that an ergonomic intervention designed to increase the comfort of the employee could also lead to higher levels of perceived organizational commitment as a result of the increased level of concern for the employee shown by the employer.

Turnover Intentions. Past research suggests that a relationship exists between affective commitment and turnover intentions. In a study conducted by Whitener and Walz (1993), this relationship was supported by finding that as affective commitment decreases, turnover intentions increase. The findings also showed that employees consider the rewards they receive from an organization and that this consideration affects their commitment to the organization. As we have seen with the previous variables, a relationship has already been established between turnover intention with other variables such as organizational commitment. However, no studies have shown evidence of a direct

relationship between ergonomic interventions and turnover intentions. Understanding this direct relationship between ergonomics and the likelihood of employees leaving the organization would be helpful in finding ways to retain good employees and minimize turnover and the costs associated with hiring and retraining of personnel. It also gives employers another avenue of enhancing the overall benefit employees receive from the employer when there is competition for the best candidates.

Purpose of Study

The purpose of this study is to provide further support for areas that have already been studied (comfort and performance) as well as initiate some new research in areas that have not yet been studied as they relate to ergonomic changes in an office environment.

Specifically, this study will attempt to address each of the following hypotheses:

- H1: Ergonomic changes in the chair, keyboard, and monitor heights will increase the employees' level of physical comfort
- H2: Ergonomic changes in the chair, keyboard, and monitor heights will increase the level of commitment an employee has toward the organization
- H3: Ergonomic changes in the chair, keyboard, and monitor heights will increase the level of perceived organizational support an employee has of the organization
- H4: Ergonomic changes in the chair, keyboard, and monitor heights will increase the level of performance an employee demonstrates
- H5: Ergonomic changes in the chair, keyboard, and monitor heights will decrease an employee's desire to leave an organization

Method

Participants

Seventy-four employees from a high-tech company volunteered to participate. Participants were grouped into one of two categories: Experimental and Control. Experimental group participants were selected based on their request for an ergonomic evaluation of their work environment. Control group participants were selected based upon the criteria that they had not yet requested nor received an ergonomic evaluation of their work environment. The employees work mainly in areas of software development, marketing, administration, sales, support, consulting, human resources, and education. More than 90% of the participants work on a computer more than 5 hours per day.

Sixty-four participants were in the Experimental group while ten were in the Control group. Within the Experimental group, there were 27 males (42%) and 37 females (58%) between the ages of 22 and 57. The average age was 32.54 with a standard deviation of 8.71. The Control group consisted of six males and four females between the ages of 25 and 51. The average age was 29.90 with a standard deviation of 7.98. A t-test revealed that the two groups did not differ in age $t(71) = .90, p > .05$.

Instruments

A survey was created with 36 questions regarding the following dependent variables: comfort, organizational commitment, perceived organizational support, performance, and turnover intentions. A scale of one to five was used where one represented the least positive response and five represented the most positive response. Appendix A contains the survey that was administered for the study.

Five of the 36 questions were created to measure comfort in order to extract information regarding specific parts of upper extremity comfort such as pain or discomfort in the hands, neck, shoulders, arms, and back. “I have pain/discomfort in my forearms” is a sample item from the survey intended to gather information regarding physical comfort. A score of 5 would mean that that the person feels no pain/discomfort in the forearm whereas a score of 1 would mean they are feeling significant pain/discomfort in the forearm. Cronbach alpha for this variable was .86.

The 8-item questionnaire by Meyer and Allen (1984) was included to measure affective organizational commitment, meaning the level at which the employee is committed to the organization. “I would be very happy to spend the rest of my career with this organization” is a sample item from the survey intended to gather information regarding affective organizational commitment. A score of 5 would mean the employee feels very happy to spend the rest of his/her career with the organization while a score of 1 would mean the employee does not want to spend the rest of his/her career with the organization. Cronbach alpha for this variable was .86.

The 15-item questionnaire by Eisenberg et al. (1986) was included to measure perceived organizational support, meaning the level at which the employee perceived the employer to care for the employee’s well-being. “This organization really cares about my well-being” is a sample item from the survey intended to gather information about perceived organizational support. A score of 5 would mean that the employee feels strongly that the employer is concerned about their well-being while a score of 1 would

indicate a low level of perceived concern from the employer toward the employee.

Cronbach alpha for this variable was .90.

Five of the 36 items were created to measure self-reported performance/productivity which is the qualitative and quantitative aspects of output. “I feel that my current workstation set-up helps my performance” is a sample item from the survey intended to gather information about the employee’s performance. A score of 5 would indicate high levels of performance while a score of 1 would indicate a low level of performance. Cronbach alpha for this variable was .49.

Finally, three of the 36 items were used from Cammann, Fichman, Jenkins and Klesh (1979) to measure turnover intentions which is the intention to leave the organization. “I often think about quitting” is a sample item from the survey intended to gather information about the employee’s intention to leave the organization. A score of 5 would indicate that the employee is not having thoughts of leaving the organization while a score of 1 would mean that they have strong thoughts of leaving the company. This variable was measured only with regard to the employee’s intention to leave the organization and not based upon actual data of terminated employees. Cronbach alpha for this variable was .69.

Procedure

The 36-item survey was administered to the participants two times. First, the survey was administered to participants prior to any ergonomic changes to their work environment. This will be referred to as the ‘Pre-test’. Approximately one week later, ergonomic changes to the chair, keyboard and monitor heights were made for the

experimental group while no changes were made for the control group. Approximately one week after the ergonomic changes were implemented for the experimental group, the 'Post-test' was administered. At the same time, the Control group also received a 'Post-test' even though no changes were made to their work environment. This Pre/Post design was used to compare changes in means in all five variables: comfort, organizational commitment, perceived organizational support, performance, and turnover intentions both before ergonomic changes and after ergonomic changes.

Ergonomic Recommendations

The specific ergonomic changes that were made were based on three primary aspects of the workstation set-up: chair height, keyboarding height, and monitor height. Employees had one of two trained ergonomists assess their work environment. Both have had similar training in ergonomics and were familiar with the organization's recommendation for addressing workstation deficiencies.

During the evaluation, the ergonomist started with the chair height, ensuring that the employee knew how to properly adjust the chair to best suit him/her. The recommended height that was used was the height that allowed the knees and hips of the employee to be at the same height.

Next, the ergonomist measured the proper keyboard height which would be where the arms formed right angles at the employee's side and the fingers laid flat without bend to the hand or wrist areas. If the employee had adjustable furniture, the ergonomist submitted a request to have the organization's facilities department make the necessary modifications to the desk heights. If the employee had non-adjustable furniture, the

ergonomist recommended that the employee order a keyboard tray with height adjustability which allowed the employee to create the proper keyboarding height.

The monitor was examined based upon height and distance. The recommended height for the monitor was where the employee's neck and head had minimal movement. In general, this height ended up approximately where the top of the screen lined up with the employee's eye level. The distance recommended was approximately 18 to 24 inches from the employee's eyes to the monitor, varying on vision differences and personal preferences. To accommodate any height shortage, the ergonomist recommended stackers that would allow the employee to raise their monitor in one-inch increments. If the monitor was too high, the ergonomist recommended the monitor be taken off of the CPU.

Keyboard trays generally arrived within one to two days and facilities generally had a lead time of about 3 days in order to complete requests to changing desk heights or installing keyboard trays. This would leave five days of sitting in the new work environment prior to receiving the Post -test.

Results

Descriptive Statistics

Global means and standard deviations were calculated for each variable for both pre and post test scenarios and also for both the Experimental and Control groups (see Table 1). The means showed a general trend of increases for the Experimental group after the ergonomic intervention for comfort, organizational commitment, perceived organizational support, and performance. Turnover intention was the only variable that

Table 1. Pre/Post Test Means for Global Variables by Group

Dependent Variable	Group	Pre-test		Post-test	
		M	(SD)	M	(SD)
Comfort	Experimental	2.98	(1.02)	3.44	(.97)
	Control	3.44	(1.22)	3.26	(1.02)
Organizational Commitment	Experimental	3.26	(.67)	3.31	(.67)
	Control	3.70	(.43)	3.61	(.35)
Perceived Organizational Support	Experimental	3.47	(.52)	3.51	(.53)
	Control	3.62	(.27)	3.50	(.45)
Performance	Experimental	3.35	(.59)	3.64	(.55)
	Control	3.58	(.66)	3.64	(.59)
Turnover Intentions	Experimental	3.85	(.91)	3.84	(.81)
	Control	4.3	(.55)	3.80	(.48)
Experimental (N=64)					
Control (N=10)					

did not increase, but stayed the same for Pre-test and Post-test results for the Experimental group. On the contrary, the Control group showed decreases in comfort, organizational commitment, perceived organizational support, and turnover intentions at the Post-test after no ergonomic intervention. Performance increased slightly for the Control group, but not as much as for the Experimental group. Overall, there seemed to be a general trend towards benefit due to the ergonomic intervention, but not enough to reach statistical significance (see Figure 1).

Correlations

Inter-item correlations (shown in Table 2) were computed to see if the items that were measured were actually measuring what was intended, whether there were redundant variables, and whether the variables overlapped. The inter-item correlations revealed that there was consistency between the measures at both the Pre and Post tests. Variables that were more correlated with each other were organizational commitment with perceived organizational support ($r=.62$, $p<.01$ at Pre-test; $r=.68$, $p<.01$ at Post-test). The variable turnover intentions was found to be closely related to all other variables. Using the Post-test scores, turnover intentions was most correlated with perceived organizational support ($r=.66$, $p<.01$). Second was organizational commitment ($r=.54$, $p<.01$). Next was turnover intentions with performance ($r=.33$, $p<.01$). Lastly, but still a significant correlation was comfort ($r=.32$, $p<.01$). These correlations should come as no surprise since past research shows strong relationships between these variables.

Figure 1. Pre/Post Test Means for Global Variables by Group

Table 2. Inter-item Correlations

		Pre-test				
		Comfort	Org Commitment	Perceived Org Support	Performance	Turnover Intentions
Post- test	Comfort	-	.14	.05	.28*	.31**
	Org Commitment	.18	-	.62**	.30*	.56**
	Perceived Org Support	.20	.68**	-	.33**	.52**
	Performance	.22	.03	.34**	-	.21
	Turnover Intentions	.32**	.54**	.66**	.33**	-

N = 74

* Correlation is significant at the .05 level (2-tailed)

** Correlation is significant at the .01 level (2-tailed)

Test of Hypotheses

In order to test this study's hypotheses, a series of two (group) by two (time) mixed analyses of variance were conducted comparing the two groups (Experimental and Control) across time (Pre and Post). In these analyses, the main effects as well as the interaction effects were examined for Group * Time to see if the change over time was the same for the two groups.

For comfort, the interaction for Group * Time was significant, $F(1,70)=7.89$, $p<.01$ (see Table 3). In order to determine the source of this significant interaction, the difference between the Pre-test and Post-test scores was analyzed separately for the two groups. These analyses revealed that comfort increased significantly for the Experimental group, $t(62)=-5.11$, $p<.01$ while actually decreasing for the Control group, $t(8)=1.15$, n.s. Therefore, this analysis supports the hypothesis that ergonomic changes to chair, keyboard, and monitor heights can improve a person's comfort level.

For organizational commitment, there was a slight increase in mean scores from the Pre-test to the Post-test. However, the interaction for Group * Time was not significant, $F(1,69)=.70$, n.s. (see Table 4). Therefore, according to this analysis, levels of organizational commitment do not increase with ergonomic changes to chair, keyboard, and monitor heights.

For perceived organizational support, there was also a slight increase in mean scores from the Pre-test to the Post-test. However, the interaction for Group * Time was not significant, $F(1,70)=1.80$, n.s. (see Table 5). Therefore, according to this analysis,

Table 3. Main Effect of Physical Comfort by Group * Time

Group			Time		TOTAL
			Pre-test	Post-test	
Experimental (N=64)	M		2.98	3.44	3.21
	(SD)		(1.02)	(.97)	(.94)
Control (N=10)	M		3.44	3.26	3.32
	(SD)		(1.22)	(1.02)	(1.10)
Total	M		3.04	3.42	
	(SD)		(1.05)	(.97)	

Source	SS	df	MS	F	
Group	.18	1	.18	.10	
Error	127.83	70	1.83		
Time	.17	1	.17	.71	
Group*Time	1.92	1	1.92	7.89	**
Error	17.04	70	.24		

**p<.01 (2-tailed)

Table 4. Main Effect of Organizational Commitment by Group * Time

			Time		TOTAL
			Pre-test	Post-test	
Group	Experimental (N=64)	M (SD)	3.26 (.67)	3.31 (.67)	3.29 (.62)
	Control (N=10)	M (SD)	3.70 (.43)	3.61 (.35)	3.66 (.36)
	TOTAL	M (SD)	3.32 (.66)	3.35 (.65)	

Source	SS	df	MS	F
Group	2.38	1	2.38	3.40
Error	48.25	69	.70	
Time	.00	1	.00	.02
Group*Time	.10	1	.10	.70
Error	9.70	69	.14	

Table 5. Main Effect of Perceived Organizational Support by Group * Time

			Time		TOTAL
			Pre-test	Post-test	
Group	Experimental (N=64)	M (SD)	3.47 (.52)	3.51 (.53)	3.49 (.50)
	Control (N=10)	M (SD)	3.62 (.28)	3.50 (.45)	3.56 (.34)
	TOTAL	M (SD)	3.49 (.49)	3.51 (.51)	

Source	SS	df	MS	F
Group	.09	1	.09	.20
Error	33.30	70	.46	
Time	.03	1	.03	.50
Group*Time	.10	1	.10	1.80
Error	4.00	70	.06	

levels of perceived organizational support do not increase with ergonomic changes to chair, keyboard, and monitor height.

For performance, there was a slightly larger increase in mean scores from the Pre-test to the Post-test. However, the interaction Group * Time was still not significant, $F(1,72)=1.46$, n.s. (see Table 6). Therefore, according to this analysis, levels of performance do not increase with ergonomic changes to chair, keyboard, and monitor height.

For turnover intentions, the interaction for Group * Time was significant, $F(1,71)=4.72$, $p<.05$ (see Table 7). In order to determine the source of this significant interaction, the difference between the Pre-test and Post-test scores was analyzed separately for the two groups. These analyses revealed that turnover intentions increased significantly for the Control group, $t(9)=2.67$, $p<.05$ while the Experimental group stayed the same, $t(62)=0.00$, n.s. Therefore, this analysis shows partial support for the hypothesis that ergonomic changes to chair, keyboard, and monitor heights can decrease a person's intention to leave an organization. The analysis more directly shows that by not implementing ergonomic changes, an employee's likelihood of leaving an organization can increase.

As a result, the findings of this study confirm the existing research that ergonomic changes do increase comfort level. On the other hand, this initial probe into the effects of ergonomics on organizational commitment, perceived organizational support, and performance do not appear to reach statistically significant results. And, although the interaction for Group * Time for turnover intentions was significant, closer examination

Table 6. Main Effect of Performance by Group * Time

Group			Time		TOTAL
			Pre-test	Post-test	
Experimental (N=64)	M		3.35	3.64	3.49
	(SD)		(.59)	(.55)	(.49)
Control (N=10)	M		3.58	3.64	3.61
	(SD)		.66	.59	.59
TOTAL		M	3.38	3.64	
		(SD)	(.60)	(.55)	

Source	SS	df	MS	F
Group	.24	1	.24	.47
Error	36.63	72	.51	
Time	.53	1	.53	3.38
Group*Time	.23	1	.23	1.46
Error	11.32	72	.16	

Table 7. Main Effect of Turnover Intentions by Group * Time

Group			Time		TOTAL
			Pre-test	Post-test	
Experimental (N=64)	M		3.85	3.84	3.85
	(SD)		(.91)	(.81)	(.79)
Control (N=10)	M		4.30	3.80	4.05
	(SD)		(.56)	(.48)	(.42)
TOTAL		M	3.91	3.83	
		(SD)	(.88)	(.77)	

Source	SS	df	MS	F	
Group	.68	1	.68	.60	
Error	80.13	71	1.13		
Time	1.07	1	1.07	4.72	*
Group*Time	1.07	1	1.07	4.72	*
Error	16.15	71	.23		

*p<.05 (2-tailed)

revealed that the difference was not due to ergonomic changes for the Experimental group, but some other factor which caused an increase in turnover intention for the Control group.

Discussion

The overall purpose of this study was to determine whether ergonomic changes to the heights of chair, keyboard, and monitor have a direct relationship to comfort, organizational commitment, perceived organizational support, performance, and turnover intentions. It was hypothesized that comfort would increase as a result of changes to chair, keyboard, and monitor height. Results of the study indicated that general physical comfort did improve significantly as a result of the ergonomic changes.

It was also hypothesized that organizational commitment, perceived organizational support, and performance would increase while turnover intentions would decrease as a result of changes to chair, keyboard, and monitor height. While organizational commitment, perceived organizational support, and performance showed trends toward improvement due to ergonomic changes, these improvements did not reach statistical significance. For turnover intentions, there was a significant increase in the intention to leave the organization for the Control group, whereas the Experimental group stayed the same before and after the ergonomic changes were implemented.

Implications of Study

The results of this study show further support that ergonomics does increase physical comfort. This finding has far reaching implications in the area of workers' compensation costs, injury rates, and potential law suits. As organizations are able to

minimize their exposure and risk to new injuries, their costs and liability associated with the injuries are also diminished. This information provides businesses with a justification to implement ergonomic interventions that will reduce workers' compensation costs and minimize liability.

This study also begins to explore other areas, which have not yet been studied in great detail, that can benefit the organization's infrastructure. Achieving a better understanding about the relationship between ergonomic interventions and psychosocial outcomes can revolutionize the way employers approach health and wellness programs. Currently, employers typically see the bottom line and how injury prevention can save money in terms of workers' compensation claims. However, if the perception of ergonomics could be changed to also be seen as a means to achieving more committed workers, higher performance, and less turnover, employers would be more likely to invest in better ergonomic programs. With more up front financial backing and support for these programs, future generations of the workforce may be the recipient of much larger impacts and benefits. Ultimately, the cost to implement a program should even pay for itself as the costs of workers' compensation claims are reduced.

Strengths of the Study

This study provides some strengths that future research can build upon. First, it was conducted in a non-industrial environment. The need for this type of study becomes increasingly apparent with the volume of hours users now spend on the computer for day to day tasks. Past research has focused primarily on hand tools and how injuries have been reduced for manufacturing environments. More recent information tells us that the

office environment and the computer pose just as big of a threat as the industrial environments that have already been studied.

Another strength is that this study further supports other research that has claimed that ergonomic changes can reduce injuries and increase physical comfort. While many people still believe that cumulative trauma injuries are figments of their imagination, more and more studies show evidence to the contrary.

The third strength this study offers is that it explores areas that have not been previously investigated. The issues addressed here provide a basis for more exploratory research into areas that could bring about changes to employer/employee relationships, human resource programs, health and wellness programs, and overall satisfaction for both the employer and the employee. Finding ways to increase organizational commitment and perceived organizational support, enhance performance, and decrease turnover intentions are all pieces of valuable information for the benefit of the organization.

Limitations of the Study/Recommendations for Future Research

There were several limitations of this study which should be changed if this study were conducted again. First with a small sample, there were limitations to the data analysis portion of this study. Although the data showed trends toward positive ergonomic impact, a larger sample may have led to statistically significant results in variables other than comfort.

Another limitation was the lack of follow up with employees to ensure that the ergonomic recommendations were actually made. Although instructions were provided to the participants of the Experimental group to fill out the Post-test only after the ergonomic

changes had been in place for one week, confirmation of this condition was not made. Without knowing this information, it cannot be verified that the ergonomic interventions were in place long enough, if at all, to have an impact.

If this study were to be conducted again, it would be recommended to address these limitations as well as consider a few suggestions. First, it would be interesting to see if there is a difference in improvement in physical comfort between the various body parts. For example, was there more improvement in the shoulders than the back or the wrists over the neck? This may help to determine priorities in addressing specific symptoms. For example, if the research does not indicate a significant improvement in back pain by making ergonomic improvements, the solution may be to change the chair first. Next, it would be beneficial to incorporate more objective measures of employee performance rather than using self reported feedback. With a low reliability as assessed by Cronbach alpha for performance used in this study, we cannot be certain that it was actually measuring what was intended.

Another recommendation would be that this study be conducted as a longitudinal study over a period of months or years rather than weeks. Having more time pass may have given the physical benefits more time to take effect. Additionally, the psychosocial effects may have needed the extra time to emerge. For example, perceived organizational support may not have been changed in the short term because the employee may have thought that the company was conducting the intervention out of legal responsibility rather than genuine interest in the employee's well-being. Over time, however, this perception may change if it is followed up over the months/years. On the other hand, having a longer

study also makes it more difficult to control for other organizational changes in climate which poses its own drawbacks.

Conclusion

This study is by no means conclusive and should be seen as a stepping stone to further, more in-depth research in this area. Once substantial research in this area has been completed, conclusions can be drawn from the research and passed on to both private and public sectors aimed at reducing injury rates as well as enhancing organizational commitment, increasing perceived organizational support, increasing productivity, and decreasing turnover. That would be a long awaited breakthrough in information on ergonomics.

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Appendix

Section I: Personal Characteristics

1. Gender: ☐ Male ☐ Female
2. Age: _____
3. What Division do you work in? (Please circle one)

Development	Consulting	Sales
Human Resources	Sales Consulting	Education
Marketing	Finance/Administration Support	
Other		
4. How long have you worked for this department? _____ years _____ months
5. How long have you worked for this organization? _____ years _____ months
6. What is your title? _____
7. How many hours do you work on the computer per day? _____
8. Have you ever received an ergonomic evaluation during your employment with this organization?
Yes _____ No _____

Section II: Attitudes about your Work Environment and the Organization

Below are statements about attitudes toward different aspects of the work environment and the organization that people may feel differently about. Using the scale provided, please indicate how much you agree or disagree with each statement.

1 = Strongly Disagree 2 = Disagree 3 = Neither Disagree Nor Agree
4 = Agree 5 = Strongly Agree

1. _____ This organization really cares about my general satisfaction at work.
2. _____ I have pain/discomfort in my hands and/or wrists.
3. _____ This organization disregards my best interests when it makes decisions that affect me.
4. _____ I feel that I am as productive as I can be.
5. _____ I think I could easily become as attached to another organization as I am to this organization.
6. _____ The comfort level of my work environment has made me have thoughts about leaving the company.
7. _____ This organization values my contribution to its well-being.
8. _____ I have pain/discomfort in my back.
9. _____ I would be very happy to spend the rest of my career with this organization.
10. _____ I work efficiently.
11. _____ This organization fails to appreciate any effort from me.
12. _____ I really feel as if this organization's problems are my own.
13. _____ I have pain/discomfort in my forearms.
14. _____ I do not feel like 'part of the family' at my organization.
15. _____ I do not feel 'emotionally attached' to this organization.
16. _____ This organization has a great deal of personal meaning for me.
17. _____ I do not feel a strong sense of belonging to this organization.
18. _____ I have pain/discomfort in my neck.
19. _____ If this organization could hire someone to replace me at a lower salary, it would do so.
20. _____ I feel that my current workstation set-up keeps me from being as productive as I can be.
21. _____ This organization would ignore any complaint from me.
22. _____ I enjoy discussing this organization with people outside it.
23. _____ Help is available from this organization when I have a problem.
24. _____ This organization really cares about my well-being.
25. _____ Even if I did the best job possible, this organization would fail to notice.
26. _____ This organization is willing to help me when I need a special favor.
27. _____ If given the opportunity, this organization would take advantage of me.
28. _____ This organization shows very little concern for me.
29. _____ I often think about quitting.
30. _____ This organization tries to make my job as interesting as possible.
31. _____ I feel that my work environment set-up helps my performance.

- 32. _____ This organization strongly considers my goals and values.
- 33. _____ I feel that my performance on the job is as good as it can be.
- 34. _____ I will probably look for a new job in the next year.
- 35. _____ This organization cares about my opinion.
- 36. _____ I have pain/discomfort in my shoulders.

IMAGE EVALUATION TEST TARGET (QA-3)

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