This is to certify that the

thesis entitled

The Effects of Chair Heights and Seat Pan Angles Upon An Individual's Wrist Position While Keyboarding

presented by

Swee-Huat Tan

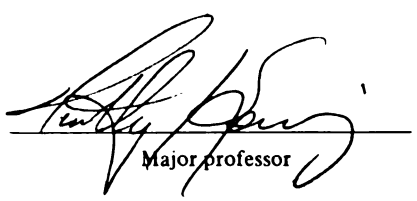
has been accepted towards fulfillment

of the requirements for

The Masters of Arts

_____degree in _____

Interior Design and Facilities Management



Major professor

June 24, 1993

Date _____

THE EFFECTS OF CHAIR HEIGHTS AND SEAT PAN ANGLES UPON AN INDIVIDUAL'S WRIST POSITION WHILE KEYBOARDING

By

Swee-Huat Tan

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ART

Department of Human Ecology

1993

ABSTRACT

THE EFFECTS OF CHAIR HEIGHTS AND SEAT PAN ANGLES UPON AN INDIVIDUAL'S WRIST POSITION WHILE KEYBOARDING

By

Swee-Huat Tan

The purpose of this study is to investigate the effect of chair heights and seat pan angles on the individual's wrist angle while keyboarding. Twenty subjects were recruited to do routine keyboarding tasks at four different sitting positions. The conditions were combinations of high and low chair, with +8 degree and -5 degree seat pan angles. At the end of the experiment wrist angles at each of the four sitting arrangements were evaluated using photographic data.

The results reveal that individuals using the low chair tend to experience less wrist angle deviation as compared to using the high chair. Consequently, subjects using the -5 degree seat pan angle tend to result in less wrist angle deviation as compared to subjects using the +8 degree seat pan angle. Individuals using a combination of low chair with a -5 degree seat pan angle experience the least wrist angle deviation when keyboarding.

This thesis is dedicated to my parents, my wife and all my family members for their love, support and generosity.

ACKNOWLEDGMENTS

My sincere thanks to Dr. Timothy J. Springer for his expert guidance and continuous encouragement; I have gained greatly from his wealth of knowledge while pursuing this research project. Special thanks also to Dr. Robert B. Snyder, a member of the committee who assisted in getting all the necessary equipments, setting up of laboratory and provided expert guidance in making this research project a success. I also thank Dr. Lily T. DeLeon for serving as one of the committee members; her contribution, constructive comments, friendship and continuous encouragement are greatly appreciated.

I would like to thank Steelcase Corporation for contributing the Steelcase Criterion chair and Steelcase Articulating keyboard support for this experiment. Thanks also to Mr. Dan Slavin, President of the International Testing Service, for the permission to use TapDance, a computer typing software program, for this experiment.

I would like to thank my parents and my family for their generous support and encouragement throughout my education. I would also like to thank my lovely wife for her moral support and continuous encouragement. Special thanks also to

all the subjects who participated in the experiments.

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CHAPTER I: INTRODUCTION

Carpal Tunnel Syndrome* (CTS) is one of the most frequent occupational injuries in the United States. American business lost about $27 billion in earnings and medical expenses in 1990 due to this condition (Jean, 1992).

Carpal Tunnel Syndrome, the "epidemic" of the 90s, is the fastest growing injury among computer users who spend most of their normal working hours doing keyboarding. Statistics show that the number of people suffering from CTS is multiplying at an alarming rate every year. It was estimated that there were 20,250 CTS cases in 1983, 54,750 in 1987, and 110,250 in 1989. The National Institute of Occupational Safety and Health indicated that, according to the record of increasing cases of CTS, unless some preventive action is taken, 50% of the workforce in the year 2000 will suffer from repetitive motion injuries* such as Carpal Tunnel Syndrome (Gorner, 1992).

Carpal Tunnel Syndrome is the result of the compression of the median nerve that passes through the carpal tunnel, a narrow 2-3 cm long passage in the wrist (see Figure 1) through which the nerves serving the thumb, index finger, middle finger and ring finger pass (Fernberg, 1991; Morgan, 1991; Falkenburg, 1988). Deviated wrist positions together with repetitive finger movements cause friction of tendons against each other at the carpal tunnel. This can eventually lead to swelling of the synovial sheath, a thin fluid-filled sack that protects the tendons. The swelling of the synovial sheath results in compression of the median nerve,

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* See glossary for definition.

which causes pain, lack of function and eventual disability. Compression of the median nerve also leads to significant increases in carpal tunnel pressure, and the occurrence of CTS (Anderson, 1988; Rosch, 1991; Harvey, 1991).

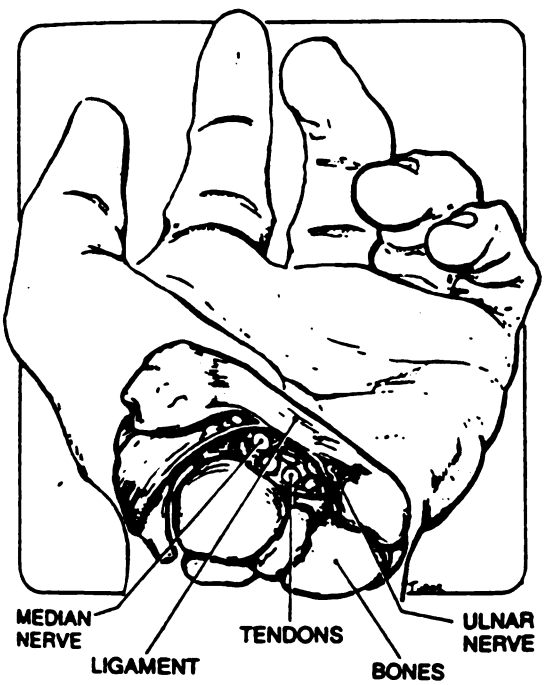

Figure 1. Cross Section of the Wrist Showing the Carpal Tunnel (Anderson, 1988).

CHAPTER II: LITERATURE REVIEW

Computers are essential in almost all professions in today's technology and information era. According to the U.S. Bureau of Labor Statistics, since the introduction of the personal computer in 1981, computer use has dramatically increased from 10 million in 1981 to over 50 million in 1991 (Proformix, 1991). Parallel to the increasing use of computers is the increase of CTS, as shown in Figure 2.

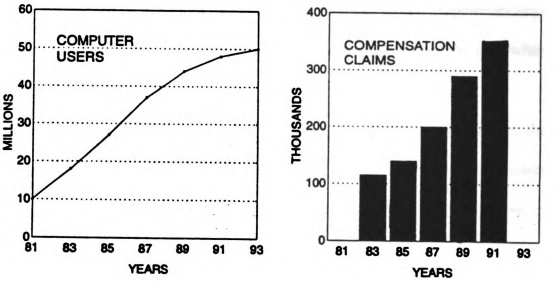

Figure 2. The Parallel Increases in Computer Users and Compensation Claims. (U.S. Bureau of Labor Statistics, cited in Proformix, 1991).

Increases of computer use and the incidence of CTS is not coincidental. Many researchers conclude that CTS symptoms can be traced back to the improper use of the computer keyboard. However, why does CTS appear to be a recent phenomenon, since people have been typing for over a hundred years? The fact is, the typing process has actually changed. In the past, almost all typewriter users completed a typing course, where they were taught to keep their wrists straight, even to the extent that a coin was placed on the top side of the hand. This practice forced them to keep the wrist straight and as close to the home row of the keyboard as possible. The old manual typewriter required typists to send the carriage back to the left after every line, insert a new sheet of paper after every page, and erase after making a mistake. All of these activities caused frequent pauses and variations of hand movements. Since the older manual typewriter keys were not touch sensitive, they were able to allow some support of the arm when at rest.

Compared to typewriter operators, most computer operators do not get the proper keyboarding training as compared to the typewriter operators. Computers also encourage repetitive finger movements, since carriage return, change of paper, and editing of errors are all done by the pressing of keys. Computers are more touch sensitive than the old manual typewriters, and provide no support to the arm when at rest. Most recent university graduates know how to operate a computer, but very few are educated in the proper use of the machine without

causing physical injury. Fast repetitive finger movements without much pause, together with the lack of wrist and forearm support, result in the "dropping" of the wrist due to fatigue, and thus the deviation of wrist angle.

The review of literature reveals that the three major factors contributing to the development of CTS for Keyboard operators are as follow:

1. Poor posture (Fernberg, 1991).
2. Highly repeated finger movements without adequate rest and the increasing pace of work (Gorner, 1992; Schenck, 1988; Van, 1992).
3. Excessive use of force (Dainoff, 1992; Fernberg, 1991; Hedge, 1992).

CTS is most likely to result from intensive keyboarding with the wrist deviated. It usually occurs when people rest their wrist on the table while their hands angle up to reach the keyboard. Keyboarding in that position for extended hours results in the inflammation and compression of the median nerve (Dainoff, 1992; Fernberg, 1991). Ironically, the advanced technology that enables such conveniences for the VDT operator as retrieval, editing and filing of documents gives rise to the occurrence of wrist injury, due to the tendency of the individual to continue keyboarding without resting. In addition, excessive use of force while keyboarding causes muscle tension and results in pain and fatigue of muscles caused by more severe strain to the tendons that work the fingers (Dainoff, 1992; Fernberg, 1991; Hedge, 1992).

Knowing that wrist deviation while keyboarding is one of the leading causes

of CTS, many researchers have investigated various options to prevent wrist deviation and achieve a neutral wrist position. Some of the devices available on the market to aid wrist support while keyboarding are the wrist-rest and the forearm support. Having the forearm supported while keyboarding has been scientifically proven to reduce muscle strain in certain areas of the body (Nakaseko, et al., 1985), but there are controversial reports on how it reduces wrist deviation. Some authors caution the use of the wrist-rest; since the underside of the wrist is very sensitive, excessive pressure on the underside of the wrist may result in wrist injury (Dainoff & Dainoff, 1986). After testing nine different wrist-rests on forty full-time data operators, Parsons (1991) documented 10% reporting "increasing discomfort" when using a wrist-rest with a traditional keyboard. Further more not one of the operators considered the wrist-rest useful. Powers, Hedge and Martin (1992) tested sixteen VDT operators, and found that full motion forearm support did not significantly change hand-wrist position, as compared to the use of the negative sloped keyboard, when keyboarding. Some researchers propose the redesign and reshaping of the keyboard in order to achieved a neutral wrist position. IBM indicates resistance to those changes, due to the fact that QWERTY keyboards are used worldwide, and making those changes would be difficult and costly (Roel, 1990).

Most keyboarding is performed at a seated position, because sitting enables better hand-eye coordination (Herman Miller, 1990). Sitting posture has been an

area of interest in the field of ergonomics for a long time. A review of sitting posture in relation to keyboarding reveals that the chair does have an intense impact on individual sitting posture, which in turn produces strain in certain areas of the body (Occhipinti, Colombini, Frigo, Pedotti, Grieco, 1985). Sitting is more demanding on the muscles and ligaments than standing, due to the rotation of the pelvis and the shift of the lumbar spine from lordosis* position to kyphosis* (Cornell, 1989). When the lumbar spine is at the kyphosis position, the enormous pressure leads to eventual disc deterioration, and, hence, back injury. Research indicates that disc pressure is 35% higher in a seated without a back support position as compared to standing upright (Cornell, 1989). Knowing that upright sitting posture reduces back injury, the traditional upright sitting posture--which is back straight with legs firmly flat on the floor and a 90-degree bend at elbow, knee and trunk-thigh angle (ANSI/HFS, 1988)--was once a recommended sitting posture for the keyboard operator, supported by nearly all sources. A few authors question the traditional proposed sitting posture (Congleton, Ayoub & Smith, 1985; Herman Miller, 1990; Lueder, 1986; Mandal, 1985). The major critical concern about the upright sitting posture, lordosis position, is that people do not sit upright all the time. Regardless of being taught to sit upright, people still slumped when they got tired (Herman Miller, 1990; Mandal, 1985).

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* See glossary for definition.

Mandal (1985) indicated that in order to achieve lordosis at the seated position, the seat pan should be tilted forward with trunk-thigh angle at about 105 degrees. Since Mandal first introduced the concept of the forward sloping chair, many studies have revealed that a forward sloping chair does induce a more upright sitting posture and reduces back pain as compared to a conventional chair with perpendicular or backward tilted seat pan angle (Mandal, 1985; Bridger, 1988; Bendix & Bloch,1986; Bendix, 1984; Congleton, Ayoub & Smith, 1985).

The chair is the foundation of the office workplace; it affects individual sitting postures, task performance and comfort or discomfort (Bhatnager, Drury & Schiro, 1985; Anderson, 1987; Cornell, 1988; Cornell, 1989). Wrist position is only one of the elements of working posture contributing to the comfort or discomfort among workers. A forward sloping chair* is one of the factors affecting individual posture that has received some attention in research efforts. Even though a forward sloping chair does help in preserving lordosis while seated, the question arises: Does such a chair also help maintain a neutral wrist position while keyboarding? As previously cited, studies have suggested that keeping the wrist straight (neutral position) while keyboarding reduces the risk of CTS. However, not enough data is available to shed light on the relationship between chair height, seat pan angle and individual's wrist angle while keyboarding.

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* See glossary for definition.

The purpose of this research is to study how different chair heights and seat pan angles* affect the individual wrist angle while keyboarding. The results obtained through this study will enable keyboard operators to better adjust their chairs to minimize the risk of getting CTS.

* See glossary for definition.

CHAPTER III: HYPOTHESES

In order to investigate if chair height and seat pan angle affects individual wrist angle while keyboarding, the following hypotheses were developed:

H1: Chair height has no significant impact on individual wrist angle while keyboarding.

H2: Seat pan angle has no significant impact on individual wrist angle while keyboarding.

CHAPTER IV: METHODOLOGY

Subjects

The study was performed with twenty healthy subjects. All subjects were initially required to type with both hands at a minimum of twenty-five words per minute, excluding errors, to be considered for the study. Subjects not meeting the minimum required keyboarding speed were excused form the experiment. Data describing subjects' demographics, select body dimensions and performance on the preliminary typing test were collected.

Equipment

The Steelcase Criterion chair (model number 453-5510AU), as shown in Figure 3, was selected for the study. It has a cushioned seat pan and back support both with fabric cover, and is firmly positioned on five casters, enabling it to move easily on the carpeted floor. The arm-rest of the chair was removed during the experiment for ease of observation and to eliminate extraneous variables.

Figure 3. The Steelcase Criterion Chair.

The chair is height-adjustable from 40.5 cm (min.) to 53.5 cm (max.), with the casters on. To accommodate subjects of shorter stature, the casters of the chair were removed in order to lower the chair height to 38.5 cm. Since the chair was placed on a hard vinyl floor surface, the chair without the casters did not restrict its movement on the surface of the floor. The seat pan could be tilted from -5 degrees (backward) to +8 degrees (forward) over a transverse axis

underneath the center of the seat. For the purpose of consistency and ease of measurement, extreme positions of a +8 degree and a -5 degree seat angles were used for this experiment. The backrest can be tilted from -3 to +16 degrees over a transverse axis position. For this experiment, the back rest was kept perpendicular to the floor in all arrangements.

The computer workstation was 76 cm high with a Steelcase articulating keyboard support that was height-adjustable from 57 cm to 71 cm. The keyboard tray tilts from 0 degree to 15 degrees. For this experiment, the keyboard tray was kept at 0 degrees parallel to the floor at all times. An IBM ps/2 keyboard, with a +7 degree slope (toward the user), was used and placed directly on the Steelcase articulating keyboard support. The keyboard thickness was 4 cm at the keys of the home row. A 14" color monitor was placed directly on the computer workstation. Viewing distance to the screen was about 76 cm, this being the mean preferred distance reported by Grandjean, Hunting & Nishiyama (1984).

A 35 mm Canon A-1 camera was used to photograph individual wrist positions for measurement and analysis. The camera was supported on a tripod with a 60" shutter cable release, which enabled the researcher to take pictures at the other side of the room without disturbing the subjects performing the keyboarding task. Overall view of the laboratory is as shown in Figure 4. Photographs were taken with subjects sitting in profile against the background of a 2 cm square reference grid, as shown in Figure 8.

TapDance, a computer-aided testing system, was utilized to time and score individual keyboarding performance. TapDance functions like any word processor and is similar to any typing test, with the main difference being that timing and scoring of the test is done by the computer. At the end of fifteen minutes, TapDance automatically stops any additional keyboarding entry, and the individual typing score is printed. Performance data were used to screen subjects at the baseline performance test. Subjects not meeting the minimum standard, keyboarding with both hands and minimum of twenty-five words per minute, excluding errors, in the pre-screening were dismissed.

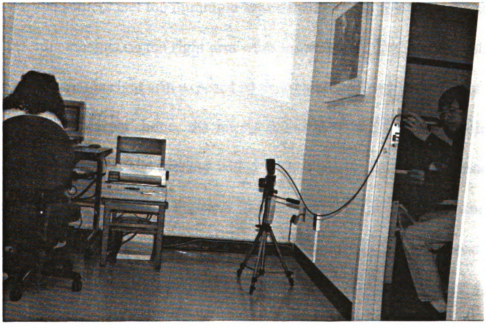

Figure 4. Overall View of Laboratory.

Experiment Procedure

The experimenter gave the same introduction regarding the experiment to each subject entering the laboratory. After this initial introduction, each subject was given a one-minute keyboarding baseline performance test to determine their keyboarding speed (words per minute) and keyboarding style. The documents used for the baseline performance test is as shown in Appendix 1. The requirement for the experiment was a minimum typing speed of twenty-five words per minute, excluding errors, and the subject had to type with both hands. For the baseline performance test, the subject was free to adjust the chair and keyboard height to his/her preferred position.

After the subject met the minimum keyboarding requirement for the study, the three reference points on the right arm were located and marked. The subject was required to have the right arm exposed so that the approximate location of the head of the fifth metacarpal* bone, the lateral epicondyle* and the pivot point of the wrist could be located and marked with a 1 cm diameter sticker for identification and measuring purposes (see Figure 5 for location). A straight line connecting all three points was treated as the neutral wrist position. The pivot between the hand and the lower arm was located by having the subject place the right hand and forearm in line by resting them on a horizontal worksurface. A guiding horizontal

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* See glossary for definition.

line connecting the head of the fifth metacarpal bone and the lateral epicondyle was located and the intersection between the line and the wrist was marked with a sticker. The angle formed by connecting the three lines was used for measuring the wrist angle.

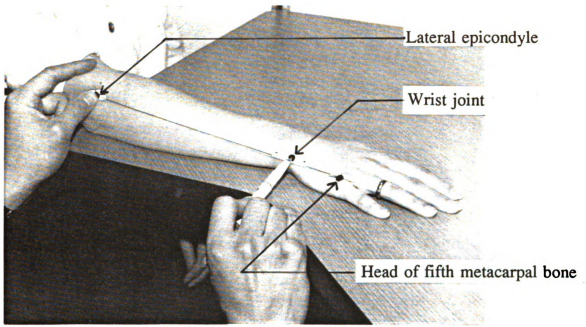

Figure 5. Location of the Three Body Reference Points: Head of Fifth Metacarpal Bone, the Lateral Epicondyle and the Wrist Pivot Point Were Marked on the Arm.

After individual descriptive and anthropometric data were recorded, the subject was seated on the chair, which was adjusted according to one of the randomly selected experimental trials. Seat height was adjusted, by the experimenter,

according to individual popliteal measurements*, as shown in Figure 6. For this study the seat height was categorized into low and high chairs. The low chair was determined by individual popliteal height minus 1 cm. This is an average seat height suggested by Bendix (1984). The high chair was determined by individual popliteal height plus 4 cm, including shoe heels (Bendix & Bloch, 1986). Seat pan angles were +8 and -5 degrees, which are the two extreme angles of the chair. Subject elbow rest height*, was also taken, as illustrated in Figure 7.

Figure 6. Measuring of Popliteal Height.

* See glossary for definition.

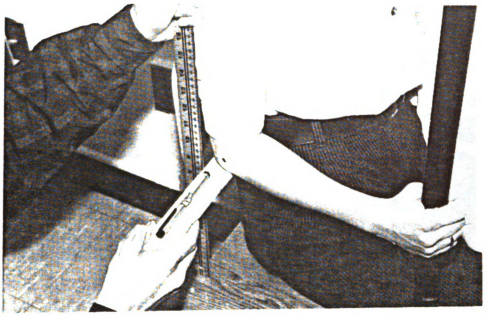

Figure 7. Measuring of Elbow Rest Height.

The subject adjusted the keyboard height, to his/her preferred position, once each, from the highest and lowest positions. The selected heights were recorded. The average of the lowest and the highest position was used as a preferred height for the subject during that experimental trial. All twenty subjects each went through the same keyboard adjustment procedure for the succeeding experimental trials.

In order to investigate the effect of chair height and seat pan angle upon the individual's wrist angle, the four different sitting arrangements were tested for each subject, as shown in Table 1, and illustrated in Figure 8. Chair height and

1. Chair height: Low
   Seat pan angle: -5 degree

2. Chair Height: Low
   Seat pan angle: +8 degree

3. Chair height: High
   Seat pan angle: -5 degree

4. Chair height: High
   Seat pan angle: +8 degree

Figure 8. Photo Illustrating the Four Sitting Arrangements Tested.

Table 1. The Four Sitting Arrangements Tested.

Arrangement	Seat Height	Seat Pan Angle	Keyboard Height
1	Low chair	-5 degree	(Note: All to be determine by subjects.)
2	Low chair	+8 degree	
3	High chair	-5 degree	
4	High chair	+8 degree	

Table 2. Four Groups of Experimental Order.

1	High Chair +8; High Chair -5; Low Chair -5; Low Chair +8
2	High Chair -5; High Chair +8; Low Chair +8; Low Chair -5
3	Low Chair +8; Low Chair -5; High Chair -5; High Chair +8
4	Low Chair -5; Low Chair +8; High Chair +8; High Chair -5

seat pan angle are the independent variables, each with one degree of freedom, with the wrist angle the dependent variable. On the basis of time at entry into the laboratory, the twenty subjects were each randomly assigned to one of the four groups of experimental order shown in Table 2, which was arranged according to the four different sitting conditions, as shown in Table 1. This was done in order to counterbalance any sequential effect. Each subject participated in all four

arrangements, as shown in Table 1, each arrangement lasted exactly fifteen minutes. In each group of experimental order, as shown in Table 2, at least one of the independent variables remained unchanged when the subject changed from one sitting arrangement to the other, to keep consistency and eliminate extraneous variables.

After the subject was seated in profile against a background reference grid of 2 cm squares, a camera was placed five feet away, focused at the same horizontal level as the subject's wrist. The center of the camera lens was used as a measuring point. A photograph was taken at five-minute intervals.

Four different documents were used in this experiment, as shown in Appendix 2, excluding the one used for the baseline performance test. The documents were randomly selected at each experimental sitting, to counterbalance any sequential effect. After the preparation procedures were completed, subjects were asked to begin keying one of the selected documents, at each of the four sitting arrangements.

Having the subjects going through all the four different sitting arrangements, with repeated measurements taken, has the advantage of allowing each subject to serve as its own comparison group. This can help reduce the confounding extraneous variables, such as skills, stature, physical strength or performance.

Sitting configuration for the keyboarding test is summarized as follows:

Chair height: Low chair, 1 cm below popliteal height (Bendix, 1984).

High chair, 4 cm above popliteal height (Bendix & Bloch, 1986).

Seat pan angle: +8 and -5 degrees.

Viewing distance from the screen: About 76 cm (Grandjean, Hunting & Nishiyama, 1984).

Documents: Provided by experimenter (see Appendix 2), same for all subjects.

Keyboard height: Adjusted by subjects.

CHAPTER V: DATA ANALYSIS

The independent variables in this study were the chair height and the seat pan angle, and the dependent variable was the wrist angle. Wrist deviation was measured from the picture by connecting the three points marked on the right arm. By the end of the experiment, twenty photos for each of the twenty subjects at each of the four sitting arrangements had been taken. The collected data were analyzed using the repeated measure analysis of variance. SPSS, a computer software program, was used to conduct the analysis. Descriptive statistics were calculated for the demographic data collected.

CHAPTER VI: RESULTS AND DISCUSSION

The summary of subjects' descriptive and anthropometric data are as shown in Table 3 and Table 4 respectively. A total of six males and fourteen females participated in the study. Average keyboarding speed, excluding errors, at the four sitting arrangements tested was about thirty-six and forty-one words per minute for the males and females respectively. Subjects participating in the experiment consisted of the following mixed ethnic groups: nine Caucasians, seven Taiwanese, two Koreans, one Singaporean and one Filipino. Average subjects' preferred keyboard height was about 70 cm for both male and female participants. Subjects participating in the study were of average size, based on the percentile of subject's anthropometric measurement shown in Table 4.

Table 3. Subjects' Descriptive Data.

Factors		Mean	Frequency
Gender	Male		6
	Female		14
Dominant Hand	Right		19
	Left		1
Eyesight (Correction)	Contact Lens		5
	Glasses		12
	None		3
Age (Years)	Male	28	
	Female	29	
Keyboard Speed (WPM)	Male	36	
	Female	41	
Preferred Keyboard Height (cm)	Male	70	
	Female	70	

Table 4. Subjects' Anthropometric Data.

Factors		Mean	Range	Population Percentile*
Stature (cm)	Men	177 cm (70")	185 cm - 168 cm	70
	Women	162 cm (64")	156 cm - 174 cm	65
Elbow Rest Height (cm)	Men	23 cm (9")	21 cm - 27 cm	35
	Women	23 cm (9")	19 cm - 26 cm	45
Popliteal Height (cm)	Men	42.5 cm (16.7")	39.5 cm - 44.5 cm	30
	Women	39.5 cm (15.6")	36.5 cm - 44.5 cm	45

* Panero, J. & Zelnik, M. (1979). Human dimension & interior space: source book of design standards. New York: Watson-Guptill Publications.

The results of the analysis are shown in Table 5. The analysis reveals that both chair height ($f = 17.10$, $p < .001$) and seat pan angle ($f = 5.05$, $p < .037$) do have significant impact on the individual wrist angle while keyboarding, at alpha equals .05. This allows hypotheses one and two to be rejected. The analysis also reveals that the time (5 min., 10 min. and 15 min.) at which the wrist angle measurements were taken, is not significant ($f = .51$, $p < .607$), at alpha equals .05. This implies a consistency across time of observed wrist angle. It also suggests the 15 minutes of experiment trial did not induce fatigue. Table 5

Table 5. Result of Repeated Measure Analysis of Variance.

Source of Variance	Sum of Squares	Degree of Freedom	Mean Squares	F	Sig. of F $p < .05$
Chair Height*	1344.27	1	1344.27	17.1	.001
Seat Pan Angle	110.70	1	110.70	5.05	.037
Time***	26.64	2	13.32	.51	.607
Chair Height by Seat Pan Angle	38.40	1	38.40	1.08	.311
Chair Height by Time	12.64	2	6.32	.32	.702
Seat Pan Angle by Time	16.59	2	8.29	.44	.647
Chair Height by Seat Pan Angle by Time	13.18	2	6.59	.22	.803

* The high and low chairs.
** The +8 degree and -5 degree seat pan angle.
*** The 5, 10 & 15 minutes wrist angle measurement at each sitting arrangement.

also reveals there is no interaction effect between either of the independent factors: chair height or seat pan angle. In this case, it can be concluded that the chair height and seat pan angle do have consistent impact on individual wrist angle while keyboarding.

Statistical results also reveal that there is no significant correlation between either of the variables. In this present study sex, age, stature, seated elbow height, and popliteal height have no significant impact on the wrist angle. This finding parallels Green, Briggs & Wrigley's (1991) study, which found that wrist angle was not related to either time, sex, adjustability of workstation, CTS, back pain, or the use of computer keyboards or typewriters.

Figure 9 reveals that the higher chair height (popliteal height plus 4 cm) results in greater wrist angle deviation than the lower chair height (popliteal height minus 1 cm). The graph also reveals that a forward sloping seat pan (+8 degrees) results in greater wrist angle deviation than a backward sloping seat pan (-5 degrees).

The wrist deviation difference while sitting at the high chair is not as apparent as while sitting at the low chair. This might be due to the fact that the high chair with popliteal height plus 4 cm, together with the backward sloping seat pan angle, resulted in the individual's feet not being fully supported on the floor. It also created a sustained pressure at the underside of the thigh just behind the knee,

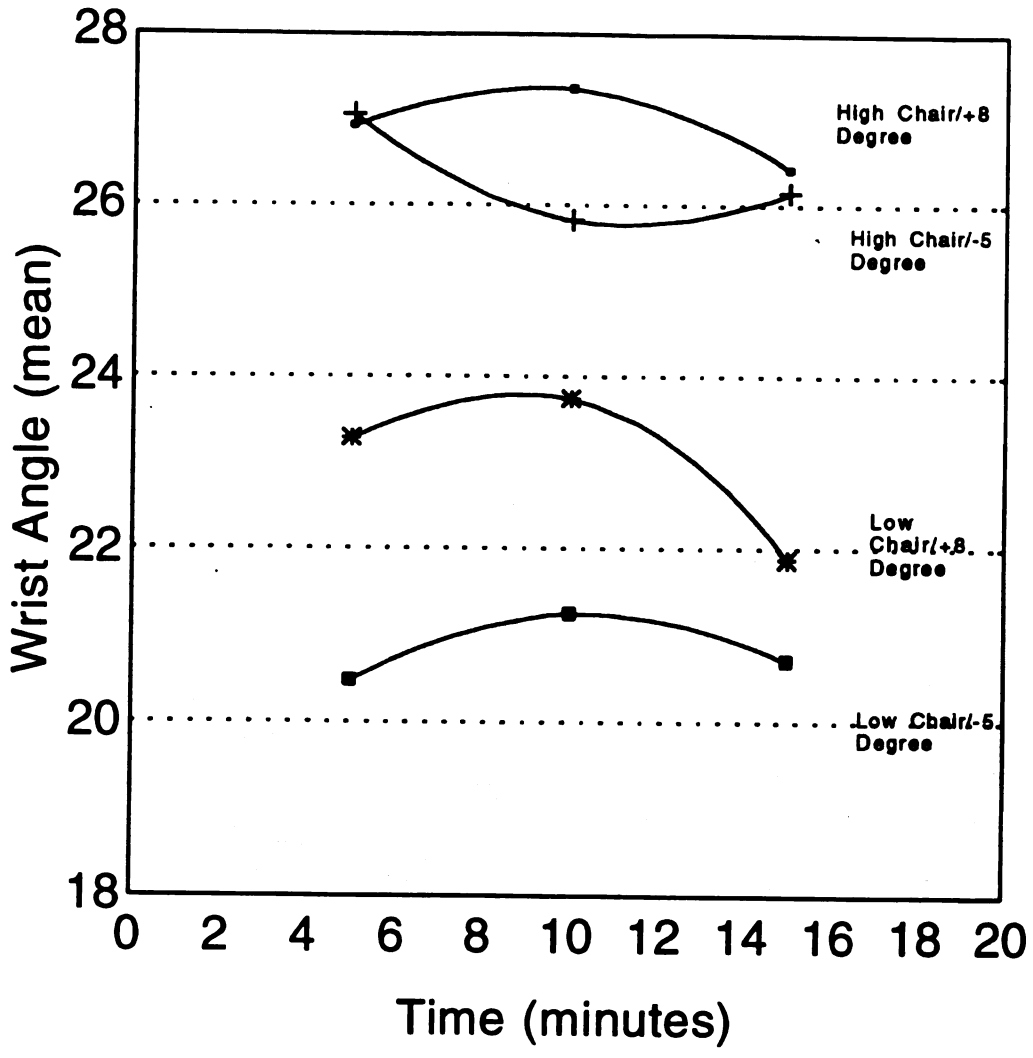

Figure 9. Graph: Chair Heights and Seat Pan Angles in Relation to Wrist Angle.

which according to Cornell (1989) will influence circulation and contribute to the potential pinching of the nerve. The above circumstances might result in discomfort and the change in the geometry of the body position, with one possibility the dropping of the wrist and hence the increase in the wrist angle deviation.

According to observation of the photographs, about 80% of the subjects lean back while keyboarding. This observation parallels Grandjean's (1984) study. Leaning backward helps transfer about 5% of the total body weight onto the backrest support; this helps to maintain a relaxed body posture and reduces muscle fatigue (Anderson, 1987; Grandjean, Hunting & Nishiyama, 1984). The remaining 20% of the observed subjects that did not lean backward are all female; almost all of them seem to exhibit more intense concentration in what they are doing, which might contribute to them sitting closer to the screen.

Both Grandjean and Mandal suggest opening the trunk-thigh angle to about 105 degrees to enhance a lordosis position. Contrary to Grandjean's backward sloping seat pan angle, Mandal (1985) suggests a forward sloping seat pan angle. In the present experiment a forward sloping seat pan angle resulted in a greater wrist angle deviation than a backward sloping seat pan angle. A forward sloping seat pan angle might shift the individual to sit closer to the screen, with the individual's shoulders being higher and closer to the screen. This might result in greater wrist

deviation, as in the present experiment.

Average preferred keyboard height in this experiment was about 70 cm, as shown in Table 3, 1 cm below the minimum preferred height suggested by Grandjean, Hunting & Nishiyama (1984). The difference might be due to the number of Asians participating in the experiment. The overall mean differences of keyboard height (home row from the floor) adjusted from the highest and the lowest was less than 0.5 cm. This finding parallels Springer's study (1982); where subjects, upon being asked to adjust the preferred chair height from the highest and the lowest, the just noticeable differences (JND) were less than 2.54 cm (0.5 inches).

CHAPTER VII: CONCLUSIONS AND RECOMMENDATIONS

One of the important lessons this experiment reveals is that chair height and seat pan angle do significantly affect individual wrist angle while keyboarding. Although the results of this study are encouraging, this is just a preliminary study. Knowing that chair height and seat pan angle do affect individual wrist angle while keyboarding, future research needs to investigate the ideal chair height and seat pan angle, in relation to human measurement, that can reduce wrist deviation while keyboarding.

In this research the keyboard was kept at 0 degrees, parallel to the floor, at all times, which might be one of the contributing factors to wrist angle deviation. Future research might include sloping keyboard angles and the impact on wrist angle deviation at a forward sloping seat pan angle.

There are a number of products designed to aid individuals to maintain a more neutral wrist angle while keyboarding. Studies conducted by Hagberg show that the use of a wrist-rest results in greater wrist deviation and discomfort, due to the

subjects trying to avoid the uncomfortable surface (Power, Hedge & Martin, 1992). Resting on the wrist-rest also results in increased pressure exerted on the sensitive carpal tunnel, that can contribute to the development of CTS. Many studies have looked at the aided device to support the wrist, but have failed to realize that if proper sitting posture is provided, wrist deviation might be lessened, and thus the risk of CTS is reduced.

Future study, such as empirical investigation of the chair in relation to wrist angle, should try to answer the following questions:

1. Is less wrist angle deviation also the most comfortable position?
2. Does providing operator control over seat height and seat pan angle affect individual wrist angle while keyboarding?
3. Does proper chair height and angle, together with a negative sloped keyboard, further minimize the wrist deviation?
4. Does chair height and seat pan angle affect individual force applied on the keys while keyboarding?

It is hoped that answers to these questions will further alleviate the suffering that affects an increasing segment of the world population, as computer technology becomes an indispensable part of not only the workplace, but of the homespace as well.

GLOSSARY

Carpal Tunnel Syndrome:
An injury at the wrist resulting from the compression of the median nerve at the carpal tunnel, usually related to repetitive motion injury.

Elbow Rest Height:
Distance from the top of sitting surface to the bottom of the tip of the elbow, with the shoulder at the relaxed position.

Forward Sloping Chair:
A chair with a seat pan that can be tilted forward from the horizontal position. In this experiment, forward tilt was set at +8 degrees (see seat pan angle).

Head of the Fifth Metacarpal Bone:
Approximately the knuckle (where the finger joins the palm) of the little finger.

Kyphosis:
Backward curve of the spine. Usually occurs when a person sits in a slumped position.

Lateral epicondyle:
A small tuberculated eminence giving attachment to the radial collateral ligament of the elbow joint, and to the common tendon of origin of the Supinator and Extensor muscles of the forearm (Gary, 1966). Visually, it is a small protrusion on the outside part of the elbow when it is bent.

Lordosis:
Forward curve of the spine. Usually occurs when a person stands in an upright position.

Popliteal Height:
Measurement vertically from the floor to the underside portion of the thigh just below the knee while subject is seated with body erect and knees at right angle.

Repetitive Motion Injury:
Repetitive movement without adequate rest that leads to wear and tear of soft tissue.

Seat Pan Angle:
If a horizontal seat pan, parallel to the floor, is a zero degree reference point, then a forward inclination is a positive seat pan angle, a backward inclination is a negative seat pan angle.

Wrist Angle:
Angle formed by bending of the hand and the forearm. Neutral (0 degree) wrist angle is when the hand is in line with the forearm.

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APPENDIX 1

DOCUMENT USE FOR BASELINE PERFORMANCE TEST.

In this section of the book you have learned about the role of a consumer. Some areas dealt with good methods in the wise use of money. These areas included buying wisely, saving for various reasons, and trying not to spend beyond your income. Wise consumer methods can assist a person in setting aside a reserve fund for various kinds of emergencies which require a cash outlay. Ways of saving included deducting from payroll, transferring a part of a payroll check to savings, and allocating a part of increases in income to savings.

A wise consumer compares the services of financial agencies when making a decision on the usage of such services. You may find interest rates on loans from a credit union frequently to be lower than the rates of a bank.

APPENDIX 2:

Documents Used in the Experiment

DOCUMENT A

(Source: Hill, N. (1965). The master-key to riches. New York: Fawcett Crest Books.)

You have, I believe, that human urge for the better things in life which is the common desire of all people. You desire economic security which money alone can provide. You may desire an outlet for your talents in order that you may have the joy of creating your own riches. Some seek the easy way to riches, hoping to find it without giving in return. That too is a common desire. But it is a desire I shall hope to modify for your benefit, as from experience I have learned that there is no such thing as something for nothing. There is but one sure way to riches, and that may be attained only by those who have the Master-Key to Riches.

This Master-Key is a marvelous device which those who possess it may use to unlock doors to the solutions of their problems. It opens the door to sound health. It opens the door to love and romance. It opens the door to friendship, by revealing the traits of personality and character which make enduring friends. It reveals the method by which every adversity, every failure, every disappointment, every error of judgment, and every past defeat may be transmuted into riches of priceless value. It kindles anew the dead hopes of all who possess it, and it reveals the formula by which one may "tune in" and draw upon the great reservoir of infinite intelligence. It lifts humble men to positions of power, fame and fortune. It turns back the hands of the clock and renews the spirit of youth for those who have grown old too soon. It provides the method by which you may take full and complete possession of your own mind, thus giving you unchallengeable control over the emotions of the heart and the power of thinking. It bridges the deficiencies of those who have inadequate formal schooling, and puts them substantially on the same plane of opportunity that is enjoyed by those who have a better education. And lastly, it opens the doors, one by one, to the Twelve Great Riches of Life which I shall presently describe. No man may hear that for which he has not the preparation for hearing. The preparation consists of many things, among them sincerity of purpose, humility of heart, a full recognition of the truth that no man knows everything. I shall speak to you of facts and describe to you many principles, some of which you may never have heard, for they are known only to those who have prepared themselves to accept the Master-Key.

Before I describe the Twelve Great Riches, let me reveal to you some of the riches you already possess, riches of which you may not be conscious. First, I would have you recognize that you are a plural personality, although

you may regard yourself as a single personality. You and every other person consist of at least two distinct personalities, and many of you possess more. There is that self which you recognize when you look into a mirror. That is your physical self. But it is only the house in which your other selves live. In that house there are at least two individuals who are eternally in conflict with each other. One is a negative sort of person who thinks and moves and lives in an atmosphere of doubt and fear and poverty and ill health. This negative self expects failure and is seldom disappointed. It dwells on sorry circumstances of life which you want to reject but seem forced to accept -- poverty, greed, superstition, fear, doubt, worry, and physical sickness.

Your "other self" is a positive sort of person who thinks in dynamic, affirmative terms of wealth, sound health, love and friendship, personal achievement, creative vision, service to others, and who guides you unerringly to the attainment of these blessings. It is this self alone which is capable of recognizing and appropriating the Twelve Great Riches. It is the only self which is capable of receiving the Master-Key to Riches. You have many other priceless assets of which you may not be aware, hidden riches you have neither recognized nor used. Among these is what we might call your "vibration center," a sort of radio broadcasting and receiving set of exquisite sensitivity, attuned to your fellow men and the universe around you. This powerful unit projects your thoughts and feelings and receives unending swarms of messages of great importance to your success in living. It is a tireless two-way communication system of infinite capacity.

Your radio station operates automatically and continuously, when you are asleep just as when you are awake. And it is under the control at all times of one or the other of your two major personalities, the negative personality or the positive personality. When your negative personality is in control, your sensitive receivers register only the negative messages of countless negative personalities. Quite naturally, this leads to "what's the use?" and "I haven't got a chance " thinking; perhaps not formulated in just those words, but discouraging, if not deadly, to faith in yourself and the use of your energies to achieve what you desire. Negative messages received when your negative personality is in control of your receiving station, if accepted and use as a guide, invariably lead to circumstances of life that are the very opposite of what you would choose.

But when your positive personality is in control, it directs to your "action center" only those stimulating, high-energy, optimistic, "I can do it" messages which you can translate into physical equivalents of prosperity, sound health, love, hope, faith, peace of mind and happiness. I wish to give you the

Master-Key by which you may attain these and many other riches. Among other things, the Key places every individual radio station under the control of one's "other self," your positive personality. I shall reveal to you the means by which you may share the blessings of the Master-Key, but the responsibility of sharing must become your own. Every close observer must have recognized that all individual successes which endure have had their beginning through the beneficent influence of some other individual, through some form of sharing. I wish to share with you the knowledge by which you may acquire riches through the expression of your own personal initiative!

That is the greatest of all gifts! And it is the only kind of gift that anyone who is blessed with the advantages of a great nation like ours should expect. For here we have every form of potential riches available to mankind. We have them in great abundance. I assume that you too wish to become rich. I sought the path to riches the hard way before I learned that there is a short and dependable path I could have followed had I been guided as I hope to guide you. First, let us be prepared to recognize riches when they come within you reach. Some believe that riches consist in money alone! But enduring riches, in the broader sense, consist of many other values than those of material things, and I may add that without these other intangible values the possession of money will not bring the happiness which some believe it will provide.

When I speak of "riches" I have in mind the greater riches whose possessors have made life pay off on their own terms. I call these the Twelve Riches of life. And I sincerely wish to share them with all who are prepared to receive them. All riches of whatever nature, begin as a state of mind; and let us remember that a state of mind is the one and only thing over which any person has complete, unchallenged right of control. It is highly significant that the Creator provided man with control over nothing except the power to shape his own thoughts and the privilege of fitting them to any pattern of his choice.

Mental attitude is important because it converts the brain into the equivalent of an elector-magnet which attracts the counterpart of one's dominating thoughts, aims and purposes. It also attracts the counterpart of one's fears, worries and doubts. A positive mental attitude is the starting point of all riches, whether they be riches of a material nature or intangible riches.

It attracts the riches of true friendship, and the riches one finds in the hope of future achievement. It provides the riches one may find in Nature's handiwork, as it exists in the moonlit nights, in the stars that float in the heavens, in the beautiful landscapes and in distant horizons. And the riches to be found in the labor of one's choice, where expression may be given to the highest plane of man's soul. And the riches of harmony in home relationships,

where all members of the family work together in a spirit of friendly cooperation. And the riches of sound physical health, which is the treasure of those who have learned to balance work with play, worship with love, and who have learned the wisdom of eating to live rather than of living to eat. And the riches of freedom from fear. And the riches of enthusiasm, both active and passive. And the riches of song and laughter, both of which indicate states of mind. And the riches of self-discipline, through which one may have the joy of knowing that the mind can and will serve and desired end if one will take possession and command it through definiteness of purpose. And the riches of play, through which one may lay aside all of the burdens of life and become as a little child again. And the riches of discovery of one's "other self", that self which knows no such reality as permanent failure. And the riches of meditation, the connecting link by which anyone may draw upon the great universal supply of Infinite Intelligence at will.

Yes, these and all other riches begin with positive mental attitude. Therefore, it is but little cause for wonder that a positive mental attitude takes the first place in the list of the Twelve Riches.

DOCUMENT B

(Source: Hill, N. (1965). The master-key to riches. New York: Fawcett Crest Books.)

An important principle of success in all walks of life and in all occupations is a willingness to go the extra mile; which means the rendering of more and better service than that for which one is paid, and giving it in a positive mental attitude. Search wherever you will for a single sound argument against this principle, and you will not find it; nor will you find a single instance of enduring success which was not attained in part by its application. The principle is not the creation of man. It is a part of Nature's handiwork, for it is obvious that every living creature below the intelligence of man is forced to apply the principle in order to survive.

Man may disregard the principle if he chooses, but he cannot do so and at the same time enjoy the fruits of enduring success. Observe how Nature applies this principle in the production of food that grows from the soil, where the farmer is forced to go the extra mile by clearing the land, plowing it, and planting the seed at the right time of the year, for none of which he receives any pay in advance.

But, observe that if he does his work in harmony with Nature's laws, and performs the necessary amount of labor, Nature takes over the job where the farmer's labor ends, germinates the seed he plants and develops it into a crop of food. And, observe thoughtfully this significant fact: For every grain of wheat or corn he plants in the soil, Nature yields him perhaps a hundred grains, thus enabling him to benefit by the law of increasing returns. Nature goes the extra mile by producing enough of everything for her needs, together with a surplus of emergencies and waste; for example, the fruit on the trees, the bloom from which the fruit is grown, frogs in the pond and fish in the seas.

Nature goes the extra mile by producing enough of every living thing to insure the perpetuation of the species, allowing for emergencies of every kind. If this were not true the species of all living things would soon vanish. Some believe that the beasts of the jungle and the birds of the air live without labor, but thoughtful men know that this is not true. It is true that Nature provides the sources of supply of food for every living thing, but every creature must labor before it may partake of that food. Thus we see that Nature discourages the habit which some men have acquired of trying to get something for nothing.

The advantages of the habit of going the extra mile are definite and understandable. Let us examine some of them and be convinced: the habit brings the individual to the favorable attention of those who can and will

provide opportunities for self-advancement. It tends to make one indispensable, in many different human relationships, and it therefore enables him to command more than average compensation for personal services. It leads to mental growth and to physical skill and perfection in many forms of endeavor, thereby adding to one's earning capacity. It protects one against the loss of employment when employment is scarce, and places him in a position to command the choicest of jobs. It enables one to profit by the law of contrast, since the majority of people do not practice the habit. It leads to the development of a positive, pleasing mental attitude, which is essential for enduring success. It tends to develop a keen, alert imagination because it is a habit which inspires one continuously to seek now and better ways of rendering service. It develops the important quality of personal initiative. It develops self-reliance and courage. It serves to build the confidence of others in one's integrity. It aids in the mastery of the destructive habit of procrastination. It develops definiteness of purpose, insuring one against the common habit of aimlessness. There is still another, and a greater reason for following the habit of going the extra mile. It gives one the only logical reason for asking for increased compensation.

If a man performs no more service than that for which he is being paid, then obviously he is receiving all the pay to which he is entitled. He must render as much service as that for which he is being paid, in order to hold his job, or to maintain his source of income, regardless of how he earns it. But he has the privilege always of rendering an overplus of service as a means of accumulating a reserve credit of goodwill, and to provide a just reason for demanding more pay, a better position, or both.

Every position based upon a salary or wages provides one with an opportunity to advance himself by the application of this principle, and it is important to note that the American system of free enterprise is operated on the basis of providing every worker in industry with a proper incentive to apply the principle. Any practice or philosophy which deprives a man of the privilege of going the extra mile is unsound and doomed to failure, for it is obvious that this principle is the steppingstone of major importance by which an individual may receive compensation for extraordinary skill, experience and education; and it is the one principle which provides the way of self-determination, regardless of what occupation, profession or calling the individual may be engaged in.

In America, anyone may earn a living without the habit of going the extra mile. And many do just that, but economic security and the luxuries available under the great American way of life are available only to the individual who

makes this principle a part of his philosophy of life and lives by it as a matter of daily habit. Every known rule of logic and common sense forces one to accept this as true. And even a cursory analysis of men in the higher brackets of success will prove that it is true.

The leaders of the American system are adamant in their demands that every worker be protected in his right to adopt and apply the principle of going the extra mile, for they recognize from their own experience that the future leadership in industry is dependent upon men who are willing to follow this principle.

It is a well known fact that Andrew Carnegie developed more successful leaders of industry than has any other great American industrialist. Most of them came up from the ranks of ordinary day laborers, and many of them accumulated personal fortunes of vast amounts, more than they could have acquired without the guidance of Mr. Carnegie. The first test that Mr. Carnegie applied to any worker whom he desired to promote was that of determining to what extent the worker was willing to go the extra mile. It was this test that led him to the discovery of Charles M. Schwab. When Mr. Schwab first came to Mr. Carnegie's attention he was working as a day laborer in one of the steel master's plants. Close observation revealed that Mr. Schwab always performed more and better service than that for which he was paid. Moreover, he performed it in a pleasing mental attitude which made him popular among his fellow workers.

He was promoted from one job to another until at long last he was made president of the great United States Steel Corporation, at a salary of $75,000 a year. Not through all the ingenuity of man, or all the schemes that men resort to in order to get something for nothing, could Charles M. Schwab, the day laborer, have earned as much as $75,000 during his entire lifetime if he had not willingly adopted and followed the habit of going the extra mile. On some occasions Mr. Carnegie not only paid Mr. Schwab's salary, which was generous enough, but he gave him as much as $1,000,000 as a bonus in addition to his regular salary.

When Mr. Carnegie was asked why he gave Mr. Schwab a bonus so much greater than his salary, he replied in words that every worker, regardless of his job or wages, might well ponder. "I gave him his salary for the work he actually performed," said Mr. Carnegie, "and the bonus for his willingness to go the extra mile, thus setting a fine example for his fellow workers."

Think of that! A salary of $75,000 a year, paid to a man who started as a day laborer, and a bonus of more than ten times that amount for a good disposition expressed by a willingness to do more than he was paid for. Verily

it pays to go the extra mile, for every time an individual does so he places someone else under obligation to him. No one is compelled to follow the habit of going the extra mile, and seldom is anyone ever requested to render more service than that for which he is paid. Therefore, if the habit is followed it must be adopted on one's own initiative. But, the Constitution of the United States guarantees every man this privilege, and the American system provides rewards and bonuses for those who follow this habit, and makes it impossible for a man to adopt the habit without receiving appropriate compensation.

The compensation may come in many different forms. Increased pay is a certainty. Voluntary promotions are inevitable. Favorable working conditions and pleasant human relationships are sure. And these lead to economic security which a man may attain on his own merits. There is still another benefit to be gained by the man who follows the habit of going the extra mile: It keeps him on good terms with his own conscience and serves as a stimulant to his own soul! Therefore it is a builder of sound character which has no equal in any other human habit.

You who have young boys and girls growing into adulthood might well remember this for their sake! Teach a child the benefits of rendering more service and better service than that which is customary, and you will have made contributions of character to that child which will serve him or her all through life.

The philosophy of Andrew Carnegie is essentially a philosophy of economics. But it is more than that! It is also a philosophy of ethics in human relationships. It leads to harmony and understanding and sympathy for the weak and the unfortunate. It teaches one how to become his brother's keeper, and at the same time rewards him for so doing.

DOCUMENT C

(Source: Golin, M., Bricklin, M., Diamond, D. and The rodale center for executive development. (Eds.) (1992, Mar.). Beat those career blues. Reader's Digest, PP. 39-42.)

Four out of five people dislike something major about their job. That is the conclusion of Richard Germann, a career management consultant who has counseled workers for 25 years. The trouble is that liking your job is essential for success. "Those who don't enjoy their work will ultimately fail," says Germann. Why are so many people unhappy in their jobs? There are two primary reasons. First, some people are convinced that earning a living is wasting time that they could spend enjoying themselves or uncovering their true talents.

If this is the case with you, recall your last long vacation. Was it two weeks of complete enjoyment? More likely it was a week and a half of fun in the sun, with another half a week of "Boy, I can't wait to get back to work." If you didn't feel such vacation blues, then imagine taking a leave of absence. You could use it to work on a novel, enroll in classes or just sit around watching TV. At the end of three months, in all likelihood, your self-esteem would be at an all-time low. While all work and no play is not good, all play and no work is disastrous. We need to feel we are accomplishing something. We also need some form of order in our lives.

The second and perhaps more prevalent reason for people not to like their work is that they feel trapped. Once you've been at a company for five years and have a spouse, a mortgage and a child, you often feel you have very little choice about jumping ship if things aren't turning out as you'd planned. A steady paycheck can be the biggest manacle of all. People resent having to do something because they have no other choice.

If you find yourself resenting your job because you can't afford to quit, it may be time to prepare what one career counselor humorously calls a "cyanide capsule." He recalls spy movies in which the secret agent has such a capsule hidden somewhere on his body. If he's captured and tortured unbearably, he has an option. And having an option gives him the strength to hold on a little longer in the hope that the situation may change. Rather than cyanide, your option takes the form of an up-to-date resume. You might also take a weekly glance through the help-wanted section, and make some visits to industry functions where low-key networking can take place. You're not giving up on your current job. Rather, you are providing yourself with an option. If things get unbearable at work, you could jump ship. Being in this position can do

wonders for your attitude. It allows you to enjoy your work since, in reality, you are there only because you want to be.

At the core of adopting a positive attitude to your workplace is, above all, assuming responsibility for your own situation. "Most people feel controlled by their environment, but they really aren't," says career management consultant Diane Blumenson. "They have to learn to manage that environment so they can get from it what they need."

Remember, nobody is likely to have the time or inclination to help you overcome your career blahs. It's largely up to you to do what you can to initiate a change in attitude. Here are give ways to get started:

1. Dream a little, plan a lot. Richard Germann often tells unhappy clients to fantasize about their dream job, everything from what they would really like to be doing to what sort of office environment they prefer. This encourages people to formulate their own definition of job satisfaction. Without that definition or goal, it's easy to feel down at work. To do this exercise, break your ideal job into the smallest possible parts. If you see yourself as a junior executive working under a great boss in marketing, when in fact you're a clerk working under a tyrant in purchasing, look for "steppingstone" goals that will advance you to the next position. For example, you might first see whether you can get a transfer to a different section of purchasing to escape the tyrant's clutches. Or why not go for a low-level position in marketing? Then get some additional training or schooling under your belt so that you look like a good executive candidate. At the very least, find out what qualifications you will need to move up the ladder. Developing and following your own plan of action is one of the biggest ways to improve your attitude.

2. Think of yourself as autonomous. Imagine that you are an independent contractor, You-Yourself Enterprises, with one major client, your employer. Then allocate your time so that you not only meet the demands of your client but also have room to develop aspects of your business that you see as necessary for your own future growth. Let's say you're working at a job that requires you to write reports and you find out you can produce nice phrases. That may not matter to the folks upstairs, but you, as an independent contractor, should realize that your writing skills may open a whole new area of sales. So rather than turn in the ordinary verbiage expected in reports, you should take the time to make your sentences glow and thereby perfect your product for a broader market. The most useful part of this concept is that it moves you from an outwardly controlled motivation of simply pleasing your boss to one where you recognize and improve your skills for your own reasons.

3. Separate work and play. Picture this: You invite a friend to stay at your

place for a few days. The second day, his clothes are everywhere. On the third day, his Saint Bernard has taken up residence on your couch. By the fourth day, you can't park in your garage because his car is there. Are you getting annoyed? The same thing happens with some people and their careers. At first they work the occasional extra hour or two in the evening. Then they start taking work home regularly during the week. Soon, weekends have become nothing more than office hours. In effect, work becomes the ill-mannered guest that takes up more and more space and time. Suddenly people don't have a life apart from work, and they resent it. This is not to say that taking work home is taboo. But doing it all the time is. If you do have a heavy workload, alternate evenings of intensive work and intensive leisure. On Monday, Wednesday and Friday evenings, for instance, do your work and try not to get sidetracked. But on your leisure nights, don't even bother taking work home.

4. Look for success outside of work. Take your hobbies and leisure activities as seriously as you do your work and take the same kind of pride in them. Too many people fall into the trap of getting their whole sense of identity from the office. This is great when things are going well, but if your self-esteem is a direct outcome of your work situation, you will feel humiliated when the going gets rough. If you can tie your self-esteem to your outside endeavors, you can maintain a positive attitude even if the office forecast calls for thunderstorms.

5. Change your attitude toward others. If you dread going to work each morning, it's probably partly because you're not getting along with those around you. You don't have to like the people you work with, but at the very least you should be able to interact positively with them. When you smile in a elevator, your fellow passengers respond with a smile. The same thing can happen in the office. "If you initiate positive interaction, you're inviting positive reaction," says Diane Blumenson. "It's human nature to react in kind." Don't worry that suddenly striking up relationships with people you heretofore ignored will come across as insincerity. The fact is, you are being sincere in your efforts to improve work relations, and that will be felt by your co-workers.

Try to have more interactions. Step outside your office and join your co-workers' discussion about the exploits of the hometown team. If you don't know much about the obscure film everybody's criticizing, express an interest by asking someone who does know. If you've lapsed into a pattern of complaining start talking to people in a more positive way. Talk about things you enjoy. It's likely you'll find something in common with at least some of

your coworkers. Change your attitude, and you're likely to change how people feel about you. They may actually like having you around. And you may actually start to like being around.

You can sit around bemoaning that you are not in the fast lane, that you're underpaid, that the corporate world is not treating, you the way you'd like, but it won't do you any good. Cash, power and prestige must come to you from you employer. But self-esteem, pride in a job well done and a sense of importance are all bonuses you can give yourself. You've got nothing to lose and everything to gain by learning to find enjoyment in your work.

DOCUMENT D

(Source: Yale, M. J. (1987). Knock 'Em Dead. Boston: Bob Adams, Inc.)

Have you heard the one about the poor man who wanted to become a famous bear slayer? Once upon a time, in a town plagued by bears, lived a man. The man had always wanted to travel but had neither the right job nor the money. If he could kill a bear, then he could travel to other places plagued with bears and make his living as a famous bear slayer. Every day he sat on the porch and waited for a bear to come by. After many weeks of waiting, he thought he might go looking for bears. He did not know much about them, except that they were out there. Full of hope, he rose before dawn, loaded his single-shot musket, and headed for the forest. On reaching the edge of the forest, he raised the musket and fired into the dense undergrowth.

Do you think he hit a bear, or anything else, for what matter? Why was he bear-hunting with a single-shot musket, and why did he shoot before seeing a bear? What was his problem? Our hero could not tell dreams from reality. He went hunting unprepared and learn what he deserved. The moral of the tale is: when you look for a job, keep a grip on reality, go loaded for bear, and do not go off half-cocked. Out there in the concrete "forest" of your profession hide many companies. Some major corporations, some small family affairs, and some in between. They all have something in common, and that is problems. To solve those problems, companies need people. Anyone who ever get hired for any job is a problem-solver. Think about your present job function: What problems would occur if you were not there? That is why you were hired, to take care of these problems.

Being a problem-solver is good, but companies prefer to hire someone who also understand what business is all about. There are three lessons you should remember:

Lesson One: Companies are in business to make money. People have loyalty to companies; companies have loyalty only to the bottom line. They make money by being more economical and saving time. And if they save time they save money, and they have more time to make more money.

Lesson Two: Companies and you are exactly alike. You both want to make as much money as possible in as short time as possible. This allows you to do the things you really want with the rest of your time.

Lesson Three: When the economy is good, you have the whip hand and can dictate the terms. This is called a seller's market. When the economy is bad, the employer has the whip hand and can dictate the terms; this is call a buyer's market.

Lesson one tells tell you the three things every company is interested in. Lesson Two says to recognize that you really have the same goals as the company. Lesson three says that anyone with any sense wants to be in a seller's market.

If you look for a jobs one at a time, you put yourself in a buyer's market. If you implement my advice, you will have multiple interviews because you will be able to handle the toughest questions, and you will get multiple job offers. This will give you the whip hand and will put you in a seller's market. Operating in a seller's market require knowing who, where, and what your buyers are in the market for, then being ready with the properly packaged product.

In this section, you will see how to identify all the companies that could be in need of your services. You will discover name of the president, those in the board, those in management; company sales volume; complete lines of company services or products; and size of the outfit. You will evaluate and package your professional skills in a method guarantee to have appeal to every employer. And you will discover highly desirable professional skills you never thought you had. A well-stock briefcase requires more than looking idly through the want ads. It means a little discipline, a little effort. But are not your professional goals worth the effort? It will take a couple of days' work to get you loaded for bear. Your first action will be a trip to the library. On the way, purchase push-pins, a large-scale area map, and some stick-on labels. Take some sandwiches; there is no feeling in the world like eating lunch on the library steps.

At the library, walk in purposefully and ask for the reference section. When you find it, wander around for a few minutes before staking a claim. You will discover that libraries are a good place to watch the human race, so get the best seat in the house. Make sure you have a clear view of the librarian's desk. When you need a rest, that is where all the comic relief takes place. There are a number of reference books you can consult, and they are listed in the Bibliography. I would not waste space teaching you how to use them here, the librarian will be happy to do that. Your goal is to identify and build personalized dossiers on the companies in your chosen geographic area. Do not be judgmental about what and who they might appear to be: you are fishing for possible job openings, so cast your net wide and list them all. Take a pad of paper, and using a separate sheet for each company, copy all the relevant company information onto that piece of paper. So that we agree on "relevant," take a look at the example on the following page.

Here, you see the names of the company's president and chairman the

board, a description of the complete lines of company services and products, the size of the company, and the locations of its various branches. Of course, if you find other interesting information, copy it down, by all means. For instance, you might come across information on growth or shrinkage in a particular area of a company; or you might read about recent acquisitions the company has made. Write it down. All this information will help you shine at the interview in three different ways. Your knowledge creates a favorable impression when first meeting the company; that you made an effort is noticed. That no else bothers is a second benefit. And third, the combination says that you respect the company, and therefore, by inference, the interviewer; this helps set you apart from the herd.

All your effort has an obvious short-term value in helping you win job offers. It also has value in the long term, because you are building a personalized reference work of your specialty that will help you throughout your career whenever you wish to make a job change. Adequate research and preparation is the very foundation for performing well at interviews. And the more interviews you have, the more your research skills will increase; they are the first step to putting yourself in a seller's market.

Interviewers today are continually asking for detailed examples of your past performance. They safely assume you will do at least as well on the new job as you did on the old one, and so the examples you give will seal your fate. Therefore, you need to examine your past performance in a practical manner that will assume you handle these questions correctly.

This chapter will show you how to identify the examples from your past that will impress any interviewer. There is a principle bonus: you will also get the correct packaged information for an excellent resume. Two birds with one stone. Resumes are important, and there are two facts you must know about them. First, you are going to need one. Second, no one will want to read it. The average interviewer has never been trained to interview effectively, properly finds the interview as uncomfortable as you do, and will do everything possible to avoid discomfort. Resumes are therefore used more to screen people out than screen them in. So your resume must be all things to all people. Another hurdle to leap is to avoiding the specialization of your skills in the resume. A cold hard fact is that the first person to see your resume is often in the personnel department. This office screens for many different jobs and cannot be expected to have an in-depth knowledge of every specialty within the company. For this reasons, your resume must be easy to read and understand, short, and use words that are familiar to the reader and that have universal appeal. Most important, it should portray you as a problem-solver.

While this chapter covers ways to build an effective resume, its main goal is to help you perform better at interview. You will achieve this as you evaluate your professional skills according to the exercises. In fact, you are likely to discover skills and achievements you didn't even know you had.