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VIDEO DISPLAY SAFETY AND HEALTH

I am submitting a thesis written by Kay T. Wilkey entitled "Video Display Safety and Health: Determination of the Level of Awareness, Concern, and Preventive Actions Taken by Businesses in the Chattanooga Area." I have examined the final copy of this thesis and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Education with a concentration in business.

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VIDEO DISPLAY SAFETY AND HEALTH:  
DETERMINATION OF THE LEVEL OF AWARENESS,  
CONCERN, AND PREVENTIVE ACTIONS TAKEN BY BUSINESSES  
IN THE CHATTANOOGA AREA

A Thesis  
Presented for the  
Master of Education Degree  
The University of Tennessee at Chattanooga

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Kay T. Wilkey  
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## ABSTRACT

# VIDEO DISPLAY SAFETY AND HEALTH: DETERMINATION OF THE LEVEL OF AWARENESS, CONCERN, AND PREVENTIVE ACTIONS TAKEN BY BUSINESSES IN THE CHATTANOOGA AREA

by

KAY T. WILKEY

This study was undertaken to determine whether employers in the Chattanooga, TN, area are following generally accepted ergonomic guidelines for VDT use and to determine whether ergonomic practices are solving health and safety complaints associated with VDT use.

The primary objective was to gain data to determine whether employers are aware and concerned about the well-being of VDT users and whether accepted ergonomic guidelines, work practices, and equipment improvements are implemented that can help ensure the safety and comfort of the employee. Secondary objectives included: (1) to determine the specialized equipment and practices used by firms to accommodate VDT users; (2) to determine whether special provisions are made for pregnant VDT users; (3) to determine whether companies are implementing special policies and training to promote the safety and comfort of VDT users; and (4) to determine the extent of union concern with problems related to VDT use.

Data were gathered through the use of personal interviews, telephone interviews, and mailed questionnaires. Interviews were conducted with 30 VDT users performing a variety of functions. Telephone interviews were

conducted with 12 VDT supervisors, and questionnaires were returned by 38 VDT operators and 16 VDT supervisors.

Major findings (including the review of the literature) revealed:

1. Radiation emission levels of all types have proven to be below accepted standards of exposure.

2. The most common problems reported with VDT use were visual complaints, musculoskeletal complaints, and stress-related complaints which appeared to be a result of ergonomic factors.

3. One of the foremost needs concerning VDT use was to provide educational material and programs for VDT users.

4. Companies/manufacturers were implementing a significant number of the recommended ergonomic features into their workstation designs.

5. Companies were implementing a significant number of the "add-on" features for the comfort and health of employees.

6. Common complaints of VDT users occurred even though recommended guidelines were generally being implemented.

7. Users of VDT terminals continued to associate vision changes with their use of the VDT.

8. No company surveyed had special provisions for pregnant VDT users.

The conclusions based upon findings purported that corrective measures had generally been adopted by work station designers and employers of VDTs but that additional study was warranted in this controversial area. Claims of prejudicial or incomplete research were common in the past, and extreme care must be taken to preserve the credibility of future studies. The researcher also suggested that the curriculum for courses with VDT applications should incorporate VDT health and safety issues.



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## TABLE OF CONTENTS

LIST OF TABLES . . . . .	iii
Chapter	
I. INTRODUCTION . . . . .	1
Why the Study Is Important . . . . .	2
The Problem . . . . .	3
Objectives of the Study . . . . .	3
Definition of Terms . . . . .	4
Limitations . . . . .	5
Organization of the Study . . . . .	5
II. REVIEW OF LITERATURE . . . . .	7
Introduction . . . . .	7
Health and Safety . . . . .	7
Visual Musculoskeletal Emotional Stress Loads . . . . .	12
Legal Aspects . . . . .	23
Conclusions from the Review of the Literature . . . . .	26
III. METHODOLOGY FOR DATA PRESENTATION . . . . .	28
Introduction . . . . .	28
Locale of the Study . . . . .	29
Sample Size and Sampling Techniques . . . . .	29
Selection of Participants . . . . .	30
Interview Procedures . . . . .	30
The Instruments Used . . . . .	31
The Interview Guide . . . . .	31
The Questionnaire . . . . .	32
Collection of Data . . . . .	33
Data Analysis Overview . . . . .	33
Summary . . . . .	34
IV. PRESENTATION OF DATA ANALYSES . . . . .	36
Introduction . . . . .	36
Responses of the VDT Users and Supervisors . . . . .	36
Years Firms Have Used Video Display Terminals . . . . .	37
Years Operators Have Used Video Display Terminals . . . . .	38
Daily Video Display Terminals Are Used . . . . .	39
Union Representation of VDT Users . . . . .	39
Consideration of VDT Users in Collective Bargaining . . . . .	40
Company Representatives Responsible for VDT Issues . . . . .	40

Number of Video Display Terminals in Work Areas . . . . .	41
Number of Printers in Work Areas . . . . .	42
Types of Lighting Used Where VDTs Are Located . . . . .	42
Special Equipment Used For VDT Health and Safety . . . . .	43
Color of Screens Used . . . . .	45
Percentage of VDT Users from Which Suggestions Are Solicited . . . . .	46
Health and Safety Policies Specifically for VDT Users . . . . .	46
Rest Breaks for VDT Operators . . . . .	46
Alternate Task Breaks for VDT Users . . . . .	47
Complaints of Isolation by VDT Users . . . . .	47
Monitoring of Keystrokes by Computer Equipment . . . . .	47
Changes in Vision for VDT Operators . . . . .	47
Special Provisions for Pregnant VDT Users . . . . .	48
Tabulation of Pains and Tensions Related to VDT Use . . . . .	49
Methods Used to Communicate VDT Safety and Health Issues . . . . .	50
Specialized Training for VDT Operators . . . . .	51
 V. SUMMARY AND DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS . . . . .	 52
Introduction . . . . .	52
Summary and Discussion . . . . .	52
Major Findings . . . . .	54
Equipment/Ergonomic Issues . . . . .	55
Health Issues . . . . .	56
Recommendations . . . . .	56
 APPENDIXES . . . . .	 
Appendix A - Ergonomic Guidelines of NIOSH . . . . .	58
Appendix B - Bell Lab Guidelines . . . . .	60
Appendix C - Pending Legislation . . . . .	64
Appendix D - Cover Letter . . . . .	67
Appendix E - Survey Instruments . . . . .	69
 BIBLIOGRAPHY . . . . .	 75

## LIST OF TABLES

1. Length of VDT Use by Companies Surveyed . . . . .	37
2. Length of VDT Use by Operators Surveyed . . . . .	38
3. Daily VDT Use . . . . .	39
4. Company Representatives Responsible for VDT Safety/Health Issues . . . . .	40
5. Number of VDTs in Work Areas . . . . .	41
6. Number of Printers in Work Areas . . . . .	42
7. Frequency Count and Percentage of Types of Lighting Used Where VDTs Are Located . . . . .	43
8. Types of Special Equipment Used Where VDTs Are Located . .	44
9. Colors/Color Combinations Used . . . . .	45
10. Complaints of Significant Vision Changes - Supervisors Vs. Operators . . . . .	48
11. Complaints of Pain by VDT Users - Supervisors Vs. Operators	49
12. Methods Used to Communicate VDT Health and Safety Information . . . . .	50

## CHAPTER I

### INTRODUCTION

About 18 million video-display terminals are in use in the United States. The following from an article in *Personnel* illustrates the expanded use of computers:

By 1990, experts predict, 40 million employees will be using VDTs on a daily basis. About 10% of office workers now use VDTs; by 1990, between 50% and 65% of office workers will be using these terminals.<sup>1</sup>

With the increase in VDT usage, a number of articles have been written about problems of employees who work with VDTs. A growing controversy about the possible effects of VDT usage on employee health has become the topic of this literature. Questions have been asked concerning radiation exposure, visual problems, reproductive problems, muscular problems (including strain), and psychosocial problems.

With concern over health problems and the body of literature related to this subject, VDT manufacturers are beginning to incorporate design features into video-display equipment and furniture to ensure employee comfort and health. The National Institute for Occupational Safety and Health (NIOSH) has begun research that may result in government standards and regulations for these machines and their usage. However, since definitive answers in the area of VDT use may be available only after years of research health and safety issues remain largely the responsibility of the employer and the operator.

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<sup>1</sup>"Video Display Terminals Health Issues and Productivity," *Personnel* 64 (May 1987): 10.

### Why the Study is Important

VDTs are revolutionizing business in the United States. With the advent of the VDT, productivity may be increased from 50 to 100 percent, depending on the type work. The new technology is not without consequences. According to a 1984 study by the Bureau of National Affairs (BNA):

Numerous studies indicate that work on VDTs can lead to musculo-skeletal, vision, and stress problems when the units are installed in an environment designed for other types of office equipment. However, these problems can be reduced or eliminated if sound, lighting, and ventilation conditions and ergonomic needs are considered at the time equipment is installed.<sup>2</sup>

According to the BNA report and a 1986 report by the Council on Scientific Affairs, no conclusive evidence exists that harmful amounts of radiation are emitted from VDTs. The Council on Scientific Affairs recommends that NIOSH and other groups continue investigations into VDT complaints with emphasis on ergonomics and stress-reduction measures. Also corporate management is encouraged to become more aware of the man-machine interface and to provide a work environment that reflects this awareness and concern. The same report states that complaints of health effects may be ergonomically related or a result of stress peculiar to the work or work environment.

Since most office workers will be exposed in varying degrees to VDT usage, awareness and education -- on the part of employers and employees-- are basic needs when confronting the new technology.

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<sup>2</sup>*VDTs in the Workplace: A Study of the Effects on Employment*, Washington: Bureau of National Affairs, 1984, p. 3.

## The Problem

According to a 1984 BNA study, experts generally agree on the measures required to reduce the adverse health effects of VDTs. Based upon preliminary research of literature and studies by NIOSH and BNA, the problem was to determine whether employers (in the Chattanooga, Tennessee, to Scottsboro, Alabama area) have become aware and concerned about problems related to VDTs and whether they are acting upon the generally accepted measures to reduce operator risk.

To solve the problem this researcher (1) identified the most common complaints and major health concerns related to VDTs, (2) identified commonly accepted specially designed equipment for VDT use, and (3) identified the most commonly accepted work practices related to VDT health.

## Objectives of the Study

The primary objective was to gain data to determine whether employers are sufficiently aware and concerned about the well-being of VDT users to implement generally accepted suggested work guidelines and equipment additions to ensure the safety and comfort of the employee. Secondary objectives included:

1. To determine specialized equipment and practices used by firms to accommodate VDT users.



2. To determine whether special provisions are made for pregnant VDT users, although research in this area is still inconclusive.
3. To determine whether companies are implementing policies and training to promote the safety and comfort of VDT users.
4. To determine the extent of union concern with the problems related to VDT use.

### Definition of Terms

The following are definitions of important terms used within the study:

The **VDT** is an electronic unit that can display information from a computer. Information appears on a screen similar to a television set, and a typewriter-like keyboard is used to communicate with the computer.

**Musculo-skeletal problems** (for the purposes of this study) refer to complaints of the neck, shoulder, back, and wrists, with the secondary complaint of arms and legs.

**Stress** refers to pressure or strain as a result of VDT use. Symptoms may include psychosomatic and nervous disorders, disturbed sleep, coronary artery and heart disease, gastrointestinal upset and indocrine imbalances. The nature of stress makes it difficult to differentiate between work-induced stress and other-induced stress.

**Visual complaints** refer to complaints of eye strain, irritation, blurred vision, and headaches among VDT operators.

**Ergonomics** refers to the interplay between humans, machinery, and the work environment, and how each element influences the others during work activity.

**Psychosocial effects** include control, privacy, alienation, isolation, and information overload.

**Radiation** refers to the emission of rays; four types of VDT-related radiation have been identified: non-ionizing radiation (low-energy X-rays), VLF radiation (very low frequency), ELF (extremely low frequency), and sound waves (mechanical radiation).

### Limitations

The limitations of the study were as follows:

1. The study was limited to participants using video display terminals for more than four hours a day.
2. The locale of the study was the metropolitan area of Chattanooga, Tennessee, with a population of approximately 426,000 and Scottsboro, Alabama, with a population of approximately 15,000. Participants were chosen from these locales in order to determine whether prospective employees in this area will face adverse conditions if they choose a business career.

### Organization of the Study

This chapter contained an introduction, importance of the study, statement of problem, objectives of the study, definitions, and

limitations. The study should be beneficial to business education teachers in order to instruct their students about safety, health, and ergonomic aspects of future VDT use. The study should also be beneficial to business by increasing awareness of problems associated with VDT use.

Subsequent chapters include: a review of related literature (presented in Chapter 2); and procedures used for the study (presented in Chapter 3). Presentation of data analyses is contained in Chapter 4, and the summary and discussions, conclusions, and recommendations for businesses and business educators and future research are presented in Chapter 5.

The summary was prepared to parallel the original problem and purposes. The conclusions appear as warranted, based on data gathered and analyzed. The conclusions parallel the original problem and purposes as well as the summary and discussion statements.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### Introduction

The review of the literature is presented in two sections. In the first section, the four major areas of health issues related to VDT use are presented. These include a discussion of radiation related threats (cataracts), the visual load, the muscular and postural loads, and emotional stress load. The second section contains a discussion of legislative protection that has been advocated by groups concerned with VDT operator health and safety along with a discussion of standards and practices in European countries.

#### Health and Safety

Concern about radiation has been the most frequently named hazard among VDT users. In 1981, the Bureau of Health and the Food and Drug Administration released the results of a radiation survey of terminals finding that VDTs emitted little or no harmful radiation under normal circumstances. These conclusions were based on standards established for television screens since no specific standards for VDTs exist.<sup>3</sup>

Four types of VDT-related radiation have been identified-- non-ionizing radiation (low-energy X-rays), VLF radiation (very low

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<sup>3</sup>*ibid.*, p. 9.

frequency), ELF radiation (extremely low frequency), and sound waves ( a form of mechanical radiation rather than electromagnetic). Although all these forms of radiation may be emitted from any of the units, extensive measurements in the United States and abroad indicate that the level of radiation emission is well below acceptable standards, even in "worst case" incidents.<sup>4</sup>

The first concern about radiation effects occurred in the Newspaper Guild, which cited several cases of cataracts in employees ages 29-35. Over a five- year period, 10 reports of cataracts among guild members (at various newspaper locations) resulted in a NIOSH ophthalmologic study. Results of the study indicated no higher incidence of cataracts among VDT users than non-users. However, exposure time to VDT use among participants of the study was not long enough to produce conclusive results. Also, other experts have discounted the risk of cataracts, claiming that 4 % of the general population between ages 35 and 45 has naturally occurring cataracts and that radiation-induced cataracts would require exposure 10,000 times that emitted from a VDT.<sup>5</sup>

The other major radiation concern involves alleged reproductive disorders. "In the last five years, 11 unexplained 'clusters' of pregnancy problems among VDT operators have been reported in the United States and Canada," stated a 1984 BNA report.<sup>6</sup> A 1987 release by *9 to 5, National Association of Working Women* stated that at least 13 publicly reported "clusters" of pregnancies have occurred in the United States,

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<sup>4</sup>"Health Effects of Video Display Terminals," *JAMA* 257 (March 20, 1987): 1509.

<sup>5</sup>*ibid.*

<sup>6</sup>*VDTs in the Workplace: A Study of the Effects on Employment*, p. 15.

Canada, and Europe. "Although clusters are not proof of a hazard, they are what epidemiologists call early warning signals that something detrimental may be happening, and that further research is needed."<sup>7</sup>

All of the reported pregnancy clusters remain unexplained, and some health experts maintain that the problems are merely a result of chance. The 9 to 5 group argues that if the problem were totally unrelated to VDT use, similar clusters would occur in the general population. Other experts counter with the claim that possibly such clusters do occur but go unnoticed because workers are not conscious of exposure to a common workplace hazard.<sup>8</sup>

According to a 1984 congressional testimony by M. B. Bond, speaking for the American College of Obstetricians and Gynecologists, 50 such clusters of problem pregnancies could be expected to occur by chance over a three-year period, 10% to 20% or more of all pregnancies spontaneously abort, and 2% to 4% of all live births have congenital malformations.<sup>9</sup>

A University of Michigan study (results revealed September 30, 1986, at the American Public Health Association's annual conference in Las Vegas), proclaimed as the first broad study of its kind, reported that no greater risk of miscarriage resulted for VDT operators who used the machines less than 20 hours weekly than for women who did not use the machines. The study found a slight increase for women who worked more than 20 hours a week, and stated that chance could account for the

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<sup>7</sup>*Video Display Safety - A Fact Sheet*, Cleveland: 9 to 5, 1987, p. 2.

<sup>8</sup>*VDTs in the Workplace: A Study of the Effects on Employment*, p. 13.

<sup>9</sup>"Health Effects of Video Display Terminals," p. 1509.

slight increase.<sup>10</sup> However, the researchers acknowledged the need for further research. The study was criticized by leaders of the Service Employees International Union and the 9 to 5 group, who observed that (1) the study did not address those individuals in automated offices with constant daily exposure to VDTs; (2) most of the pregnant workers actually were more likely to work less than 5 hours a week on a VDT; and (3) the study did not interview sufficiently large numbers of workers who use VDTs more than 20 hours a week.<sup>11</sup>

NIOSH hoped to have a definitive answer to the reproductive question sometime this year. In 1985, they planned to begin a large-scale study of female telephone operators at Southern Bell, South Central Bell, and AT&T to look for links between VDT usage and adverse pregnancy outcomes. Harvard and Brown universities questioned the validity of such a study and efforts were thwarted by the Office of Management and Budget (OMB). The controversy arose over questions related to stress and fertility, and NIOSH was ordered by OMB to delete these questions from the study.<sup>12</sup> According to a report in OSHA Reporter, the SEIU is urging the Secretary of Health and Human Services to override OMB's demands and restore the controversial questions about stress and fertility. NIOSH is considering the terms imposed by OMB before continuing the study.<sup>13</sup>

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<sup>10</sup>"Risks to Pregnant Women Unlikely From Part-Time Use, Study Indicates," *Occupational Safety and Health Reporter* 16 (October 8, 1986): 482.

<sup>11</sup>"University of Michigan Study Criticized by SEIU; Limitations in Information Seen," *Occupational Safety and Health Reporter* 16 (October 15, 1987): 518.

<sup>12</sup>"Health Effects of Video Display Terminals," p. 1511.

<sup>13</sup>*Occupational Safety and Health Reporter* 16 (December 24, 1986): 521.



The emission of low-level X-rays remains a gray area and one of much concern in the arena of VDT safety. Results of studies in this field remain inconclusive. The Mt. Sinai Hospital Medical School began a study of 10,000 VDT workers in June 1985 " . . . to determine whether low levels of radiation emitted by VDTs are associated with higher risks of miscarriage and birth defects. Results will not be known until 1989."<sup>14</sup>

The 9 to 5 group's results indicated that reproductive hazards are not limited to female employees. When chromosome damage is involved, it is possible for ovum or sperm to be damaged even before conception.<sup>15</sup>

Although many experts disagree whether women should operate VDTs during pregnancy, many unions and women's organizations are pushing for transfer rights of pregnant VDT operators. The Service Employee's International Union (SEIU) and the 9 to 5 group have joined together to campaign for state legislation and coordinated regulatory efforts to protect VDT operators.<sup>16</sup>

The Communications Workers of America's president, Morton Bahr, has also called on the federal government to conduct more detailed research on VDT health effects.<sup>17</sup>

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<sup>14</sup>Phillip L. Polakoff, "Viewpoint - Research Inconclusive on Long-Term Health Effects of VDTs," *Occupational Health and Safety* 55 (August 1986): 54.

<sup>15</sup>*Campaign on VDT Risks. Analysis of VDT Operator Questionnaires of VDT Hotline Callers*, Cleveland: 9 to 5 - National Association of Working Women, 1984, p. 2.

<sup>16</sup>"Unions Join Forces for VDT Work Laws," *Occupational Health and Safety* 54 (February 1985): 75.

<sup>17</sup>"Video Display Terminals," *National Safety and Health News* 132 (October 1985): 120.



One other item of interest should be noted. The use of lead aprons for pregnant VDT operators has created a surge of interest recently. According to 9 to 5, the Canadian Center for Occupational Health and Safety has warned that wearing a lead apron could be hazardous by imposing extra weight and possibly extra stress on the fetus. CCOHS concludes that lead aprons do not block low frequency radiation and therefore provide "no benefit whatsoever."<sup>18</sup>

### Visual, Musculoskeletal, Emotional Stress Loads

"Surveys of workers who use VDTs indicate that complaints and symptoms of job-related ocular discomfort, musculoskeletal discomfort, and stress are common,"<sup>19</sup> states a National Research Council report published in 1983. Furthermore, the report states that surveys of comparison groups indicate that non-VDT workers exhibit fewer complaints of this nature. However, shortcomings of surveys in this area include poorly designed studies, failure to establish that complaints are tied solely to VDT use and not other aspects of the work environment, and failure to consider the heterogeneity of VDT job situations. The lack of adequate controls in the research situation has left many open questions concerning VDT use.

**Eye Problems.** The terms visual fatigue and eyestrain are frequently used in poorly-defined or differing ways. Ocular discomfort, changes in oculomotor functions, and changes in visual performance might better describe eye problems associated with VDTs.<sup>20</sup>

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<sup>18</sup>*Public Citizen* (February 1986): 16.

<sup>19</sup>National Research Council, *Video Displays, Work, and Vision*, Washington: National Academy Press, 1983, pp. 1-2.

Surveys of operators have reported complaints of ocular discomfort and other vision difficulties such as itching, dry, gritty, stinging, and watery eyes. Other eye sensations include pain or fatigue and blurring or other difficulties with vision.<sup>21</sup> The 9 to 5 group identifies eye problems as the single most frequent health complaint of VDT users, and states that these problems " . . . stem from long hours spent staring at the flickering light source (the screen) with frequently poorly legible characters under condition of improper lighting, glare, and often intense pressure."<sup>22</sup> In a 9 to 5 survey (6,000 VDT operators called a hot-line number and 873 returned questionnaires), almost half the participants (48.6%) had incurred vision problems or changes in eyesight since working with VDTs and had sought treatment for these problems.<sup>23</sup> Also, the 9 to 5 research cited a Swedish study that found 75% of data entry clerks surveyed who used VDTs 7 hours a day complained of severe visual fatigue and a NIOSH study finding over 90% of the operators reporting eyestrain or other visual problems.<sup>24</sup>

In a 1985 study of New York state employees researchers found that the prevalence and severity of eye problems were more strongly related to time spent working on a VDT than the type tasks performed.<sup>25</sup> However, the diversity of VDT jobs makes it difficult to form generalizations concerning eye problems and the lack of objective

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<sup>20</sup>*ibid.*

<sup>21</sup>*ibid.*

<sup>22</sup>*Video Display Safety - A Fact Sheet*, p. 1.

<sup>23</sup>*Campaign on VDT Risks. Analysis of VDT Operator Questionnaires of VDT Hotline Callers*, p. 8

<sup>24</sup>*Video Display Safety - A Fact Sheet*, p. 1.

<sup>25</sup>*Occupational Safety and Health Reporter* 16 (November 5, 1986): 604.

measures of ocular discomfort makes it difficult to identify the cause. A

1983 National Research Council report makes this statement:

The literature related to visual effects of VDTs is growing rapidly. The number of articles published per year went from 1 in 1972 to 43 in 1980 (Matula, 1981). This literature, however, has done little to answer the questions that have been raised. Only a dozen or so formal studies of visual complaints or changes in visual function among VDT workers have been published, and most fail to meet major criteria for acceptable scientific research.<sup>26</sup>

According to the same report, poor display quality often hampers visual performance and probably contributes to the discomfort sometimes reported by VDT operators. Visual performance is affected by such factors as character size, structure, style, image contrast, and stability (flickering effect). While light characters on a dark background can help reduce the flicker sensitivity of the eye, dark characters on a light background may be best for reducing reflections on the screen and for adaptation to different luminance levels.

The correct character size depends on viewing distance. "It is better to have a large screen, a viewing distance of more than two feet, and character height of at least 3/16 of an inch," states a 1980 NYCOSH report.<sup>27</sup> A movable keyboard allows adjustment of viewing distance, an important feature. Screen color should be dark green with lighter green or yellow characters, or black with white characters.

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<sup>26</sup>National Research Council, pp. 7-8.

<sup>27</sup>*Health Protection for Operators of VDTs/CRTs*, New York: New York Committee for Occupational Safety and Health, Inc., 1980, p. 7.

One other aspect of screen problems should be discussed-- the "flicker effect." Flicker effect may be defined in this manner:

Light emitted by the phosphorus on the inside surface of the screen fades rapidly and must be constantly refreshed. If the refresh rate is less than 60 times per second -- called 60 hertz (Hz.) -- as it is on many machines, a flicker, or jumping of images, may sometimes be seen.

Increasing the brightness increases the flicker effect. . . . The best balance can only be achieved if the operator can adjust the machine. There is no brightness that is best for all operators or machines.<sup>28</sup>

That VDT operators on the whole have more problems with lighting than non-VDT workers has not been established, but VDTs do present some special problems. Lighting that was designed for traditional desk-top work often causes problems because the geometrical relationships between working surfaces and light sources change. Problems with glare, images reflected on the screen, and reduction in visibility of the display image may present themselves. Filters may be placed over the VDT screen to reduce glare and reflections to some degree but their effectiveness is limited, and they should never be used as a substitute for lighting control. A 1980 New York Committee for Occupational Safety and Health (NYCOSH) study has the following suggestions for reducing glare caused by direct light being reflected on the screen:

- Blinds or awnings installed on nearby windows;
- Relocation of machines or lighting fixtures;
- Installation of indirect lighting (correctly designed for screen viewing);

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<sup>28</sup>*ibid.*

- Reduction of general lighting, without making printed copy difficult to read;
- Installing dimmers on overhead lighting so that operators can adjust lighting to the most comfortable brightness.<sup>29</sup>

Another significant factor associated with ocular discomfort is the result of a background that is too bright such as a white wall or window. The eye pupil adjusts to the "total light" entering the eyes and images on the screen can become difficult to see. Operators often lower their heads to block the light, resulting in neck and back problems along with "eyestrain."<sup>30</sup>

The American Academy of Ophthalmology claims that the type eye discomforts associated with VDT use will not permanently damage the eye.<sup>31</sup> For the present, NIOSH guidelines recommend that workers have their vision tested before beginning work with VDTs and periodically thereafter.

**Musculo-skeletal problems.** According to an article in *National Safety and Health* by Wilbert O. Galitz, many are now questioning the ability of workers' minds and bodies to cope with the dramatic changes brought about by broadened technology. Furthermore, technology that fatigues the worker can have an impact on worker safety and health. Stressors can be classified as either physical or psychosocial. For the purpose of this research, physical stressors are those of vision

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<sup>29</sup>*ibid.*, p. 4

<sup>30</sup>*ibid.*

<sup>31</sup>"Health Effects of Video Display Terminals, p. 1510.

(previously discussed) and the muscles. As a result of automation, physical activity is often reduced, resulting in fatigue.<sup>32</sup>

Two types of muscular stress are identified-- static posture stress, a result of maintaining the same posture over a period of time, and repetitive strain injury (RSI) the result of performing the same physical activity rapidly over long periods of time. RSI, originally associated with assembly line jobs, is now an area of complaint among computer operators.

Repetitive strain injury (tenosynovitis) may result in permanent damage if muscles are not given a chance to recuperate. Tenosynovitis can lead to carpal tunnel syndrome, or inflammation of tendons in a narrow passageway on the palm side of the wrist. This condition can be very painful and may require corrective surgery to relieve pressure on the affected nerve. According to a BNA report, women are three times more susceptible to repetitive strain injuries than men, with middle-aged women the most susceptible of all workers.

VDT operators have complained of many musculoskeletal problems including shoulder, neck, back, arm, hand, wrist, and finger pain. Sauter, Arndt, and Gottlieb surveyed 250 clerical VDT operators and 84 matched non-VDT operators and found the VDT operators to be significantly more uncomfortable than the control group.<sup>33</sup>

The National Research Council states that musculoskeletal complaints rank second only to vision complaints for VDT operators and

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<sup>32</sup>Wilbert O. Galitz, "Proper Planning Stems Automation Atrophy," *National Safety and Health News* 132 (October 1985): 96.

<sup>33</sup>"Video Display Terminals Health Issues and Productivity," p. 10



are more prevalent among VDT users than other office workers.

Typically reported problems include:

. . . shooting pains in the arms; acute pain or stiffness in the arms, legs, neck, shoulders, and/or back; acute wrist or finger pain; anesthesia or parasthesia of the extremities; and chronic pain in the neck, shoulder, back, or extremities.<sup>34</sup>

Most studies, including a 1983 National Academy of Sciences report, attribute musculoskeletal problems to poorly designed workstations. VDTs are often installed in offices designed for typewriters with no changes in desk height, chairs, or lighting. When this occurs, workers are often forced to sit in an unnatural position for hours while operating the equipment. The following from a National Research Council report summarizes the conditions in many offices:

Having invested in office automation, an organization is reluctant to see the equipment idle for a moment and often decries any time that is "wasted" on breaks. Tasks that once required office workers to move around frequently, such as filing or communicating with persons in other areas, are now a part of the automated system; workers are thus deprived of minor diversion, social interaction, and periodic exercise, which tend to relieve muscle strain and alleviate other stressful conditions on the job.<sup>35</sup>

**Stress/Psychosocial Consequences.** While physical stressors referred to the direct physical effects of physical forces (visual and musculoskeletal), psychosocial stress refers to conditions of the environment. Psychosocial stressors may include job design, personal interrelationships, and isolation from the broader structure of the organization.<sup>36</sup>

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<sup>34</sup>"Health Effects of Video Display Terminals," p. 1510.

<sup>35</sup>*ibid.*

<sup>36</sup>National Research Council, p. 176

The 9 to 5 group cites stress as " . . . the least visible, but potentially most insidious, health problem faced by VDT workers.<sup>37</sup> Several factors are responsible for stress problems. Increased productivity demands and computer monitoring of productivity are probably two of the leading problems and most despised practices. According to Chapnik and Gross, results of research by NIOSH determined that approximately two thirds of American VDT operators are electronically monitored to determine speed, accuracy, and efficiency.<sup>38</sup> According to the BNA, in many cases employers prefer monitoring offices because of productivity increases, and in some cases, the monitoring is done without the workers knowledge. Keystrokes are counted by computer, providing supervisors with detailed records of individual productivity. In other instances monitoring is used to determine wage levels, a practice despised by unions and employees alike.

Galitz states that the practices of counting keystrokes and unannounced performance monitoring are extremely stressful and that employees subjected to these practices report anxiety, distress, anger, and fear, with lowered performance, lowered morale, and higher turnover being the results of such practices.<sup>39</sup> NIOSH states that the 9 to 5 group reports on stress, automation, and health show error rate increases of 40 to 400% when control of work pace is taken from the employee and given to a machine.<sup>40</sup>

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<sup>37</sup>*Video Display Safety - A Fact Sheet*, p. 2

<sup>38</sup>"Video Display Terminals: Health Issues and Productivity," p. 12.

<sup>39</sup>Galitz, p. 98.

<sup>40</sup>*VDTs in the Workplace: A Study of the Effects on Employment*, p. 21.



Loss of control, reduced status, fear of job loss, and less need or opportunity to participate in the broader organization are other stress-inducers related to VDT use. Galitz sees worker lack of control as a primary cause of job stress.<sup>41</sup> As automation increases, the job focus and control shifts from the operator to the machine, producing negative feelings in the operator. The operator sees himself as the limiting element, yet is forced to contend with "down time" and productivity rates. Status and fear of job loss are other VDT operator concerns. According to the BNA, almost half the clerical VDT operators believed they would be replaced by a computer sometime in the future. The National Research Council blames ". . . impersonal, repetitive, boring, tasks; . . . a real or imagined sense of work overload; responsibilities. . . reduced; and lack of social interaction with fellow workers . . ." <sup>42</sup> for some of the stress involved with VDT work. These factors, combined with machine monitoring, produce an aggravated situation for the VDT operator.

One other factor is "cyberphobia" or fear of new technology and automation in particular. The National Research Council quotes L. Damordan, ("Health Hazards of VDTs"):

Fears about new technology may be expressed as health hazards because these constitute the only legitimate reasons in our society to reject the technology.<sup>43</sup>

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<sup>41</sup>Galitz, p. 97.

<sup>42</sup>"Health Effects of Video Display Terminals," p. 1510.

<sup>43</sup>*ibid.*

Attempts to make computer systems more "user friendly" to the average worker are continuing. Recent developments point to the future use of "the spoken voice" as a user input device.

Stress manifests itself in a number of common symptoms and warning signs including psychosomatic nervous disorders, disturbed sleep patterns, coronary artery and heart disease, and gastrointestinal upset. The underlying causes of stress may be rooted in off-the-job problems, making it difficult to measure stress inducers accurately.

*Occupational Health and Safety* makes the claim that technology has its price and that many workers are paying that price with bits and pieces of their psychological stability.<sup>44</sup> NIOSH is quoted in the same article as linking high-tech involvement with chronic stress-related disorders, predicting an increase in worker psychological disorders, and considering psychological conditions to be one of the 10 leading work-related disorders. NIOSH states that VDT operators have the highest stress levels ever recorded for any occupation, including air traffic controllers.

"A North Carolina survey of telephone company workers showed that almost 20 percent suffer angina as a result of using video display terminals(VDTs) for more than 50 percent of their work time, 10 times the rate found in the general population," states a March 1985 article in *Occupational Health and Safety*.<sup>45</sup> This information was presented to

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<sup>44</sup>"Stats Show Stress is Sizable Hazard," *Occupational Health and Safety* 55 (December 1986): 10.

<sup>45</sup>"VDT Survey Shows Angina Increased," *Occupational Health and Safety* 54 (March 1985): 7.

an American Heart Association science writer's seminar as the first study relating VDT usage and angina. The study conducted by S. G. Haynes, Chief of Medical Statistics for the National Center for Health Statistics in the Public Health Service, surveyed 278 South Central Bell workers who spend more than four hours a day on a terminal. Of those studied, 19.1 percent reported angina, compared with 10.1 percent of the control group (218) who did not use VDTs.<sup>46</sup>

Koffler says an ergonomically designed office is one that supports the physical, psychological, and social needs of the people who work there with the goals of increasing human performance and satisfaction, controlling stress, and minimizing health and safety risks.<sup>47</sup> Since ergonomics is not an exact science, each situation should be analyzed individually, using research as a guideline, listening to employee preferences and encouraging their participation and evaluating all data to determine whether objectives are being met.<sup>48</sup>

The National Research Council states that one of the foremost needs is to provide educational programs and material to VDT users. In addition to educational materials related to safe VDT use, employees should be well informed about research developments in this controversial area. An ample number of ergonomic guidelines are available for selection, installation, and use of VDT equipment. A good example of such a guideline is that prepared by Bell Telephone Laboratories in 1983 (Appendix A). NIOSH has also published a set of

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<sup>46</sup>*ibid.*

<sup>47</sup>Richard P. Koffler, "Using Ergonomic Logic In Designing Offices," *The Office* 104 (October 1986):15.

<sup>48</sup>*ibid.*

ergonomic guidelines as a result of its research in this area (Appendix B).

### Legal Aspects

The Occupational Safety and Health Act was passed in 1970 to protect workers against unsafe working conditions. The law is enforced by the Occupational Safety and Health Administration (OSHA). Citations may be issued to any employer who neglects to take measures to correct unsafe working conditions, and any employer failing to obey a citation may be fined.

The Occupational Safety and Health Act set up a research branch called the National Institute of Occupational Safety and Health (NIOSH). The NIOSH role in safety and health hazards in the workplace is described by 9 to 5:

NIOSH does conduct studies and investigations of health hazards at VDT workplaces. Three or more workers, or the union that represent them, may request that NIOSH investigators come in and conduct a Health Hazard Evaluation of their workplace if they believe they are facing a serious health problem. If it decides an inspection is warranted, NIOSH has the authority to make an investigation of the workplace and issue specific recommendations to employers, although it has no legal enforcement power to issue citations or fines. NIOSH can deny a request for a Health Hazard Evaluation when it does not believe the complaint presents a serious problem or affects enough people.<sup>49</sup>

According to 9 to 5, OSHA has issued no safety standards that apply to VDT work; therefore, it has no existing standards to enforce. The 9 to 5 group claims that, "In practice it is difficult to get an OSHA official to

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<sup>49</sup>*Legal Rights for VDT Users*, Cleveland: 9 to 5 - National Association of Working Women, 1985, p.6.

look into a workplace hazard unless there is a 'recognized' hazard that is a clear violation of a standard, or unless workers' lives are put in immediate danger."<sup>50</sup>

Currently, California, Colorado, Massachusetts, New Mexico, Washington, and Wisconsin have enacted laws establishing machine performance and ergonomic standards for VDTs and 30 more states are considering such laws.<sup>51</sup> State purchasing guidelines have been issued in several states, including Massachusetts and Wisconsin, that require all state government employees to buy and use ergonomically designed equipment. The growing concern for VDT operator safety has resulted in some employers and manufacturers developing their own standards and guides for the safe use of VDTs. NIOSH has also developed a set of ergonomic guidelines for VDT use (Appendix B).

A spokesperson for 9 to 5 told this researcher that they did not have enough employees to keep abreast of state legislative actions regarding VDTs. However, a copy of the 1985 status of pending legislation or other state actions was obtained (Appendix C). In order to determine the status of legislative action in the tri-state area, government officials in Tennessee, Georgia, and Alabama were contacted.

Robert Cooper, a representative of the Tennessee Department of Labor's Standards and Procedures Section of the Tennessee Occupational and Safety Administration reported that no current legislation was pending in the Tennessee legislature. He reported that a committee was appointed in 1986 to look into the issue, but that no action had resulted from the committee's work.

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<sup>50</sup>*ibid.*

<sup>51</sup>"Health Effects of Video Display Terminals," p. 1511.

W. W. Fincher, Georgia State Representative from Chatsworth, reported that no legislation related to VDT safety and health had been introduced in the Georgia state legislature.

Mike Morgan, Assistant Commissioner of the Alabama State Department of Labor, stated that he was not aware of any legislative actions related to VDT safety and health in Alabama. His statement was confirmed by a representative of the Alabama Legislative Reference Service.

In some European countries, recommendations for a safe and healthy work environment are very strong. 9 to 5 states:

The Workers Environment Act of Norway calls for an end to monotonous work and recommends that the professional advancement of workers be considered in designing jobs and that workers have input into the design of their work and the equipment. Union agreements in Austria limit continuous work on a VDT to four hours a day. In Sweden, productivity is measured for a department rather than for an individual, and by the month, not the hour. These and other measures would redesign jobs to prevent many of the worst effects brought about by office automation, including stress and resistance to technology.<sup>52</sup>

From February to June, 1984, the Labor Health and Safety Subcommittee, chaired by Rep. Joseph Gaydos (Democrat, Pennsylvania), held a number of hearings to explore VDT health issues. The Service Employees International Union (SEIU) contended that only 37 percent of government clerical workers and 15 percent of private clerical workers were represented by unions; therefore, federal regulation of VDT use was needed. However, the business and medical

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<sup>52</sup>*Campaign on VDT Risks. Analysis of VDT Operator Questionnaires of VDT Hotline Callers, p. 3*



communities have generally opposed federal regulation, claiming that improvement of the work environment would relieve most symptoms. The National Research Council fears that poorly framed standards would " . . . cause stagnation in the technology and inflexibility in dealing with future issues."<sup>53</sup>

Chapnik and Gross state that as of September 1984, the 9 to 5 personnel had identified 32 VDT-related workers' compensation claims (group and individual). Of the 32 claims, 20 have been settled and twelve are pending. Seventeen of the settled claims involved alleged musculoskeletal damage or strain, and the claimants were successful in obtaining workers' compensation.<sup>54</sup>

#### Conclusions from the Review of the Literature

The review of the literature substantiated that the VDT has become a fixture in the modern office, and the number of VDTs in private homes has grown considerably. There is much concern about possible adverse health effects as a result of VDT use. The information gained from the literature reviewed contributed in developing the research design and indicated the following:

1. Radiation emission levels of all types have been proven to be below accepted standards of exposure. No association between radiation emissions and spontaneous abortions, birth defects, cataracts, or other injuries can be proven.

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<sup>53</sup>"Health Effects of Video Display Terminals," p. 1511.

<sup>54</sup>"Video Display Terminals: Health Issues and Productivity," pp. 12-13.

2. The most common problems reported with VDT use are visual complaints, musculoskeletal complaints, and stress-related complaints. At present, adverse health effects appear to be a result of ergonomic factors and can be solved by altering the mechanical design of equipment and improving management/employee relations.
3. Labor unions and special interest groups (SEIU and 9 to 5 especially) have advocated legislation to establish both equipment and labor standards. However, the National Research Council and others oppose mandatory standards, fearing poorly framed standards will lead to stagnation and inflexibility in the future. Those who oppose federal regulation suggest following ergonomic guidelines.
4. One of the foremost needs concerning VDT use is to provide educational material and programs to VDT users. Most companies rely on magazine articles rather than a structured program to educate VDT users about health and safety concerns.
5. Six states (California, Colorado, Massachusetts, New Mexico, Washington, and Wisconsin) have enacted laws establishing machine performance and ergonomic standards for VDT use. Although 30 states are considering such laws, Tennessee, Alabama, and Georgia have no pending legislation related to VDT use. (The Tennessee state legislature appointed a committee to study the issues in 1986, but no action has resulted.)



## CHAPTER III

### METHODOLOGY FOR DATA PRESENTATION

The problem investigated in this study was: (1) to determine whether employers in the Chattanooga, Tennessee, to Scottsboro, Alabama, area have become aware and concerned about problems related to VDTs and whether they are acting upon the generally accepted measures to reduce operator risk.

Subordinates to the problem included (1) identification of the most common complaints and major health concerns related to VDTs, (2) identification of the commonly accepted specially designed equipment for VDT use, and (3) identification of the most commonly accepted work practices related to VDT health.

The primary objective of the study was to gain data to determine whether employers are sufficiently aware and concerned about the well-being of VDT users to implement generally accepted suggested work guidelines and equipment additions to ensure the safety and comfort of the employee. Secondary objectives included: (1) to determine the specialized equipment and practices used by firms to accommodate VDT users; (2) to determine whether special provisions are made for pregnant VDT users, although research in this area is still inconclusive; (3) to determine whether companies are implementing policies and training to promote the safety and comfort of VDT users; and (4) to determine the extent of union concern with the problems related to VDT use.

### Locale of the Study

The primary data for this study were gathered from participants in the Chattanooga, Tennessee, to Scottsboro, Alabama, area through interview and questionnaire techniques. Participants in this area were chosen in order to plan more effective curricula relevant to the needs of this geographic area.

UTC serves a metropolitan population of over 426,000 and the tri-state area of southeastern Tennessee, northwestern Georgia, and northeastern Alabama; therefore, graduating business education teachers are likely to teach in high schools and colleges in the area covered by the survey.

### Sample Size and Sampling Techniques

Parten defined an optimum sample as one that fulfills the requirements of efficiency, representativeness, reliability, and flexibility. The sample should yield desired information with the required reliability at minimum cost. After considering (1) the homogeneity of the population, (2) that personal interviews would be conducted with VDT users as a means of validating data gathered by questionnaires completed by supervisors of VDT users, and (3) that distribution of the questionnaires was sufficiently controlled to preclude biasing of the data presented, the criteria presented by Parten appeared acceptable.<sup>55</sup>

Englehart stated that random sampling is fundamental to statistical inference. Samples should be selected at random from the populations

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<sup>55</sup>Mildred Parten, *Surveys, Polls, and Samples: Practical Procedures*, New York: Harper & Brothers, 1950, pp. 300-314.

to which generalizations are to apply in order that the use of internal estimates and significance will not be questionable. When random sampling is used, each part of the population has an equal and independent chance of being included in the sample. When populations differ materially, it may be desirable to classify sample by strata.<sup>56</sup>

### Selection of Participants

The participants included VDT users and supervisors from 68 firms as determined by the following procedures: firms randomly selected from business section of the Chattanooga and Scottsboro telephone directories were used to provide potential participants. Six hundred and forty-eight firms were determined for the sample as possibly having video display terminal operators meeting the survey criteria (minimum of 4 hours a day). A 20 percent sample was taken so that 130 firms were contacted by telephone calls made by the researcher. Of the 130 firms contacted, 68 (over 10 percent of the identified population) agreed to participate in the study.

### Interview Procedures

The interview method was used to gather part of the primary data for several reasons:

1. Increased reliability and validity were possible as responses of the supervisors were their own responses and not the responses of an operator who might have opened the mail had the mail been used.

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<sup>56</sup>Max D. Engelhart, *Methods of Educational Research*, Chicago: Rand and McNally and Company, 1972, pp. 238-246.

2. Personal visitation should encourage supervisors to become more knowledgeable of collegiate courses related to VDT use and provided opportunities for the researcher to become more aware of office facilities, equipment, and practices.
3. Through the exchange of ideas and information, questions were clarified for both supervisors and the researcher.

"The interview permits exchange of ideas and information; it is not necessarily a one-way method."<sup>57</sup> Summaries of the data were promised to those who desired to know the outcomes, and confidentiality regarding individual interview and questionnaires were assured each participant.

An effort was made to conserve the supervisors' and operators' time. This effort should have minimized the cost to the participants.<sup>58</sup>

### The Instruments Used

The interview and the questionnaire forms were developed with the cooperation and assistance as detailed in the following paragraphs.

### The Interview Guide

The interview guide was designed to assure that the same data would be sought from interviewees. The interview guide was revised by the

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<sup>57</sup>Carter V. Good, *Essentials of Educational Research*, 2nd. ed., New York: Appleton-Century-Crofts, 1972, p. 23.

<sup>58</sup>Glenn H. Petry and Stanley R. Quackenbusk, "The Conservation of the Questionnaire as a Research Resource," *Business Horizons*, August 1974, p. 23.

researcher based on trial interviews with VDT users and supervisors and a critique by the researcher's advisor.

The number of questions included in the interview guide was limited to the number that could be discussed in about 5 to 10 minutes. This seemed to be the maximum time that one could ask or expect from a supervisor during the business day.

In some cases, copies of the questions were reproduced and handed to the participants to facilitate the interview process by providing response alternatives to the interviewee. In most cases, the interviewee was allowed to complete questions subsequent to the interview and return the form to the researcher by mail.

Participants in telephone interviews were allowed to choose a mailed questionnaire to minimize any adverse effect on their personal schedule.

### The Questionnaire

The questionnaire was prepared and revised after trial use with VDT users and supervisors. Revisions were based on the responses received and comments made by the researcher's advisor. Questionnaires were distributed when it was not feasible to conduct personal interviews by telephone or visitation. Good, Barr, and Scates emphasize that questionnaires are normally used when the researcher cannot personally conduct interviews with all the people from whom responses are desired. In addition, there was no particular reason to see each participant personally.<sup>59</sup>

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<sup>59</sup>Carter V. Good *et. al.*, *The Methodology of Educational Research*, New York: Appleton-Century-Crofts, 1941, p. 24.

A cover memorandum accompanied each mailed questionnaire, and results of the findings were promised to each participant when requested. Under all circumstances, complete confidentiality of the data was assured.

### Collection of Data

The interviews began on June 2, 1987, and were completed July 8, 1987. Questionnaires obtained on or before July 16, 1987 were included in the study. From the 149 contacts made (operators and supervisors), the researcher received 96, or 64 percent responses.

### Data Analysis Overview

The data from the completed questionnaires and interview guides were tallied manually by the researcher. Total responses and the percentage of the question responses were figured and analyzed based on the 96 interview guides/questionnaires completed.

The data analyses included univariate and bivariate statistical descriptive profiles as recommended by Moser.<sup>60</sup> Frequency and percentage tables are used in this section. For example, descriptive analysis of the question: "Type of lighting used where VDT is located?" would be depicted in the form shown in Table 3.1.

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<sup>60</sup>C. A. Moser, *Survey Methods in Social Investigation*, London: Heinemann, 1967, pp. 288-307.

TABLE 3.1  
 FREQUENCY COUNT AND PERCENTAGES  
 OF TYPES OF LIGHTING USED WHERE  
 VDT'S ARE LOCATED\*

Lighting Types	Number	Percent
Direct	34	34
Indirect	54	54
Fluorescent	73	73
Incandescent	22	22
Diffused	8	8
Other	0	0
No Response	1	1
Total	96	100

\*Table 3.1 contains simulated data

The values in the table indicate how the respondents answered the question. For example, of the total number of supervisors and VDT users who participated in the survey, 34, or 35 percent indicated that direct lighting was used to illuminate the area in which VDTs are located.

### Summary

This chapter contained the methodology for data presentation. The locale of the study, sample size and sampling techniques, selection of participants, interview procedures, description of the instruments used, collection of data, and data analyses overview were delineated. Of the probable 648 firms, 130 were chosen as a sample. This represented



slightly over a 20 percent sample. Of the 130 firms contacted, 68 were determined to use VDTs over 4 hours a day. The design of this study was basically a descriptive empirical type of survey.

Collection of data were described. Data analyses were overviewed.

## CHAPTER IV

### PRESENTATION OF DATA ANALYSES

The analyses of the data presented in this chapter reflect the findings obtained for this study. The data obtained from the supervisors and VDT users is not tabulated separately unless a particular reason for separating the data existed. The responses of the supervisors and the users was tabulated separately for three questions that were judged to be susceptible to prejudice on the part of the supervisor or the user or both. The responses of the supervisors and the users was tabulated separately for two questions because the responses required significantly different interpretations based upon the persons interviewed. The data were based on responses from 28 supervisors and 68 VDT users in the tri-state area served by UTC. Of the 50 questionnaires distributed by mail, 17, or 34 percent were returned to the researcher. Thirty additional questionnaires were distributed by a local office worker's union and 22 (or 73 percent) were returned to the researcher.

#### Responses of the VDT Users and Supervisors

Percentages throughout the subsequent section were based on data gained through personal interviews with or questionnaires completed by 28 supervisors and 68 VDT users. The following profile evolved from the data collected.

## Years Firms Have Used Video Display Terminals

The analysis of the data in Table 4.1 delineated the number of years the firms have been using video display terminals. Because video display use is increasing rapidly, the responses were categorized in six-month intervals.

TABLE 4.1  
LENGTH OF VDT USE  
BY COMPANIES SURVEYED

Length of Usage	Number	Percent
Less than 6 months	0	0
6-12 months	1	4
1-2 years	2	7
More than 2 years	18	64
No Response	7	25
Total	28	100

\*Table 4.1 contains data from the responses of the supervisors only. Responses of the VDT users was tabulated separately since company use of VDTs was considered to have a different connotation than individual VDT use.

The analysis of the data in Table 4.1 revealed that 64 percent of the firms had been using video display terminals for more than 2 years; 7 percent had been using the equipment 1-2 years; 4 percent had used the equipment for 6-12 months; and none of the firms had used the equipment for less than 6 months.

## Years Operators Have Used Video Display Terminals

The analysis of the data in Table 4.2 delineated the number of years the operators have been using video display terminals. Because video display use is increasing rapidly, the responses were categorized in four intervals ranging from less than 6 months to more than 2 years.

TABLE 4.2  
LENGTH OF VDT USE  
BY OPERATORS SURVEYED

Length of Usage	Number	Percent
Less than 6 months	2	3
6-12 months	1	1
1-2 years	7	10
More than 2 years	43	63
No Response	15	22
Total	68	100

\*Table 4.2 contains data from the responses of the VDT users only. Responses of the supervisors was tabulated separately since company use of VDTs was considered to have a different connotation than individual VDT use.

The analysis of the data in Table 4.2 revealed that 63 percent of the operators had been using video display terminals for more than 2 years; 10 percent had been using the equipment 1-2 years; 3 percent had used the equipment for less than 6 months; and 1 percent had used the equipment for over 6-12 months.

### Daily Video Display Terminals Use

The analysis of the data in Table 4.3 delineated the number of hours video display terminals are used daily. The responses were categorized in 1-hour intervals with a 4 hours daily minimum based on the limits imposed on the study.

TABLE 4.3  
DAILY VDT USE

Hourly Usage	Number	Percent
4-5 hours daily	47	49
5-6 hours daily	8	8
6-7 hours daily	11	11
7-8 hours daily	20	21
Over 8 hours daily	5	5
Other (including "varies")	5	5
Total	96	100

The analysis of the data in Table 4.3 revealed that 49 percent of VDT users used video display terminals for 4-5 hours daily; 21 percent used VDTs for 7-8 hours daily; 11 percent used the equipment for 6-7 hours daily; 8 percent used the equipment 5-6 hours daily; and 5 percent used the equipment for over 8 hours daily.

### Union Representation of VDT Users

The analysis of the data showed that 2, or 3 percent, of the firms surveyed are represented by unions and 66, or 97 percent, were not represented by unions.

### Consideration of VDT Issues In Collective Bargaining

The analysis of the data revealed that VDT issues were not part of the collective bargaining agreement for any of the firms in the survey. A union representative for one of the major firms contacted did disclose that VDT issues had been "on the table" during collective bargaining.

### Company Representatives Responsible for VDT Issues

The analysis of the data in Table 4.4 delineated the company representatives responsible for VDT safety and health issues. Although the participants were asked to specify the person responsible for VDT issues in their companies, the answers were categorized into specific categories as shown in Table 4.4.

TABLE 4.4  
COMPANY REPRESENTATIVES RESPONSIBLE  
FOR VDT SAFETY/HEALTH ISSUES

Representative	Number	Percent
Supervisor	6	21
Personnel Staff	2	7
Employees	1	4
Nobody Responsible	19	68
Total	28	100

NOTE: The data in table 4.4 included only the responses from the supervisors. Data from VDT users were susceptible to duplication since more than one operator from some participating firms were included in the survey.

The analysis of the data in Table 4.4 revealed that 68 percent of the firms had not made anyone responsible to monitor VDT health and safety issues; 21 percent relied on the supervisors themselves; 7 percent relied on the personnel staff; 4 percent relied on the employees themselves.

#### Number of Video Display Terminals in Work Areas

The analysis of the data in Table 4.5 delineated the number of video display terminals at each work location for the VDT users surveyed and for the typical work station for supervisors surveyed. The data was categorized in intervals of 5 VDTs ranging from 1-5 to over 20.

TABLE 4.5  
NUMBER OF VDT'S IN WORK AREAS

Number of VDTs	Number	Percent
1-5 VDTs	53	55
6-10 VDTs	9	9
11-15 VDTs	11	11
16-20 VDTs	8	8
Over 20 VDTs	11	11
No Response	4	4
Total	96	100

The analysis of the data in Table 4.5 revealed that 55 percent of the work locations had 1-5 VDTs; 11 percent had 11-15 VDTs; 11 percent had more than 20 VDTs; 9 percent had 6-10 VDTs; 8 percent had 16-20 VDTs; and 4 percent had over 20 VDTs.



### Number of Printers in Work Areas

The analysis of the data in Table 4.6 delineated the number of printers at each work location for the VDT users surveyed and for the typical work station for supervisors surveyed. The data was categorized in intervals of 5 printers ranging from 1-5 to over 20.

TABLE 4.6  
NUMBER OF PRINTERS IN WORK AREAS

Number of Printers	Number	Percent
1-5 Printers	75	78
6-10 Printers	5	5
11-15 Printers	7	7
16-20 Printers	1	1
Over 20 Printers	4	4
No Response	4	4
Total	96	100

The analysis of the data in Table 4.6 revealed that 78 percent of the work locations had 1-5 printers; 7 percent had 11-15 printers; 5 percent had 6-10 printers; 4 percent had more than 20 printers; and 1 percent had 16-20 printers.

### Types of Lighting Used Where VDTs Are Located

The types of lighting used in VDT work locations were depicted in table 4.7. Each of the categories of lighting listed in the table were presented as alternatives on the interview guide or the questionnaire.

TABLE 4.7  
 FREQUENCY COUNT AND PERCENTAGES  
 OF TYPES OF LIGHTING USED WHERE  
 VDT'S ARE LOCATED

Lighting Types	Number	Percent
Direct	5	5
Indirect	20	21
Fluorescent	58	60
Incandescent	4	4
Diffused	8	8
Other	2	2
No Response	23	24
Total	*96	*100

\*Some participants provided more than one answer, such as fluorescent and indirect.

The analysis of the data in Table 4.7 revealed that 21 percent of the work locations had indirect lighting; 3 percent had direct lighting; 8 percent had diffused lighting; 4 percent used incandescent lighting; and 60 percent used fluorescent lighting.

#### Special Equipment Used For VDT Health and Safety

The types of special equipment used with VDTs in work locations covered by the survey were depicted in Table 4.8. Each of the types of special equipment listed in the table were presented as alternatives on the interview guide or the questionnaire.

TABLE 4.8  
 TYPES OF SPECIAL EQUIPMENT USED  
 WHERE VDT'S ARE LOCATED

Special Features	Number	Percent
Adjustable VDT Tables	16	17
Adjustable chairs	84	88
Foot Rests	4	4
Wrist/Arm Rests	4	4
Document Holders	67	69
Movable Keyboards	80	83
Palm Rests	12	13
Matte Keyboard Finish	91	95
Adjustable Screen	69	71
Anti-glare Filters	51	53
Noise reduction covers (printers)	50	52
Special Lighting Devices	12	13
Adjustable Brightness Screens	78	81
Total	96	100

Note: The possibility existed for each participant to select each alternative presented.

The analysis of the data in Table 4.8 revealed that 95 percent of the work locations were provided with matte-finished keyboards; 88 percent were provided with adjustable chairs; 83 percent were provided with movable keyboards; 81 percent were provided with adjustable brightness screens; 71 percent of the work stations had chairs with adjustable screens (tilt and/or height); 69 percent were provided chairs with document holders; and 53 percent were provided anti-glare filters for the VDT screens.

Fifty-two percent were provided with noise-reduction covers for their printers; 17 percent had adjustable VDT tables; 13 percent had palm

rests; 13 percent had special lighting; and only 4 percent had wrist/arm rests; and 4 percent had foot rests.

### Color of Screens Used

The colors used for VDTs were depicted in table 4.9. Each of the colors or color combinations listed in the table were presented as alternatives on the interview guide or the questionnaire.

TABLE 4.9  
COLORS/COLOR COMBINATIONS USED

Colors/Color Combinations	Number	Percent
Amber	6	6
Green	55	57
Black on White	3	3
White on Black	5	5
Blue	2	2
Other	13	14
No Response	12	13
Total	96	100

The analysis of the data in Table 4.9 revealed that 57 percent of the work locations had green screens; 6 percent had amber screens; 5 percent had white-on-black screens; 3 percent used black-on-white; 2 percent used blue screens, and 14 percent had some other color or colors.

### Percentage of VDT Users from Whom Suggestions Are Solicited

The analysis of the data revealed that 23, or 24 percent, of the VDT users had been solicited for their suggestions regarding the equipment purchased for use with the VDTs.

### Health and Safety Policies Specifically for VDT Users

"Does your company have any health or safety policies specifically for VDT users?" was answered affirmatively by only 3 companies, or 10 percent. Only the responses of the supervisors were considered for this question since VDT operators working for the same company would have provided duplicate answers.

### Rest Breaks for VDT Operators

Responses of the survey participants to the question, "Are VDT operators entitled to rest breaks?" revealed that 82 or 85 percent are entitled to rest breaks.

Those answering affirmatively were further asked to specify the approximate length of the breaks, the interval between the breaks, and whether the breaks were mandatory or optional. The lengths of the breaks ranged from 10 to 30 minutes with the 15 minute break period mentioned most often. Only one participant reported that breaks were mandatory.

### Alternate Task Breaks for VDT Users

Responses to the question "Are VDT operators provided with alternate task breaks to limit continuous VDT use?" revealed that 46 or 62 percent of the 74 VDT operators who responded were provided with alternate task breaks specifically to limit continuous VDT use.

### Complaints of Isolation by VDT Users

Supervisors in the survey were asked to respond to the question, "Have VDT users complained of being isolated from other employees (as a VDT user)?" VDT users were asked to respond to the similar question, "Do you feel isolated from other employees (as a VDT user)?"

None of the participants responded affirmatively to the question.

### Monitoring of Keystrokes By Computer Equipment

Seven of the 65 participants (11 percent) who responded to the question, "Is keystroke monitoring used?" indicated that their work was monitored by the equipment being used.

### Changes in Vision for VDT Operators

VDT operators were asked whether significant changes in vision had occurred after they began using VDTs. Similarly supervisors were asked whether complaints of vision changes had occurred.

Fourteen of the 56 participants (25 percent) indicated that significant vision changes or claims of vision changes had occurred. This data is

tabulated separately in Table 4.10 to illustrate the different perspectives of supervisors and operators.

TABLE 4.10  
COMPLAINTS OF SIGNIFICANT VISION CHANGES  
SUPERVISORS VS. OPERATORS

	Number	Percent
Supervisors	1 of 18	6
Operators	13 of 38	34
Total	14 of 56	25

The analysis of the data in Table 4.10 revealed that 34 percent of the VDT operators related a vision change to VDT use, but that only 6 percent of the supervisors acknowledged the existence of such complaints.

#### Special Provisions for Pregnant VDT Users

None of the 68 firms surveyed (based on responses of supervisors and operators) indicated that any special provisions for pregnant VDT users existed in their company.



Tabulation of Pains and Tensions Related to VDT Use

Participants in the survey were asked to indicate the types of pain, if any, that they had experienced as VDT users. As in Table 4.10, the data is tabulated separately for supervisors and operators.

TABLE 4.11  
COMPLAINTS OF PAIN BY VDT USERS  
SUPERVISORS VS. OPERATORS

	Number	Percent
Supervisors		
Back Pain	4 of 16	25
Neck Pain	2 of 16	13
Headaches	5 of 16	31
Tension	2 of 16	13
Operators		
Back Pain	23 of 38	61
Neck Pain	23 of 38	61
Headaches	23 of 38	61
Tension	24 of 38	63
Totals		
Back Pain	27 of 64	39
Neck Pain	25 of 64	41
Headaches	28 of 64	42
Tension	26 of 64	44

The analysis of the data in Table 4.11 revealed that 61 to 63 percent of the VDT operators related some type of pain to VDT use, but that only 13 to 31 percent of the supervisors acknowledged the existence of such complaints. The percentages for supervisors and operators (combined) were as follows: tension (44 percent), headaches (42 percent), neck pain (41 percent), and back pain (39 percent).

## Methods Used to Communicate VDT Safety and Health Issues

The data tabulated in Table 4.12 illustrates the various methods used by companies to communicate VDT safety and health issues to VDT users. Each of the alternatives was presented to the participant.

TABLE 4.12  
METHODS USED TO COMMUNICATE VDT HEALTH  
AND SAFETY INFORMATION

	Number	Percent
Memoranda	13	14
Newsletter	7	7
Educational Pamphlet	13	14
Bulletin Board	7	7
Safety Meeting	9	9
Other	8	8
None	39	40
No Response	5	5
Total	96	100

Note: The possibility existed for participants to select more than one method.

The data analyses determined that 40 percent of the VDT users had received no formal or informal communication from their company related to VDT safety and health. For companies that do communicate these issues to their employees, memoranda and/or educational pamphlets are the most common method of communication (14 percent). Other methods were safety meetings (9 percent), bulletin boards (7 percent) and newsletter (7 percent).

## Specialized Training for VDT Operators

VDT operators and supervisors were asked whether their company provided specialized training related to VDT safety and ergonomic issues. Fifty-six of the 70 participants (80 percent) that responded to the question answered negatively.

CHAPTER V  
SUMMARY AND DISCUSSIONS, CONCLUSIONS, AND  
RECOMMENDATIONS

Introduction

The final chapter of this study includes: (1) the summary and discussion of (a) the variables investigated, (b) research procedures employed, and (c) major outcomes and results; (2) conclusions based upon the major outcomes and results; and (3) recommendations. Based on the findings of the study, appropriate recommendations are directed to business educators, business students (prospective VDT users), the business community, and others interested in similar research.

Summary and Discussions

This empirical study was undertaken to determine whether employers in the Chattanooga, TN, area are following generally accepted ergonomic guidelines for VDT use and to determine whether ergonomic practices are solving health and safety complaints associated with VDT use.

The primary objective was to gain data to determine whether employers are aware and concerned about the well-being of VDT users and whether accepted ergonomic guidelines, work practices, and equipment improvements are implemented that can help ensure the safety and comfort of the employee. Secondary objectives included: (1) to

determine the specialized equipment and practices used by firms to accommodate VDT users; (2) to determine whether special provisions are made for pregnant VDT users; (3) to determine whether companies are implementing special policies and training to promote the safety and comfort of VDT users; and (4) to determine the extent of union concern with problems related to VDT use.

Data were gathered through the use of personal interviews, telephone interviews, and mailed questionnaires. Interviews were conducted with 30 VDT users performing a variety of functions in Chattanooga, TN and Scottsboro, AL. Telephone interviews were conducted with 12 VDT supervisors, and questionnaires were returned by 38 VDT operators and 16 VDT supervisors.

A review of the pertinent literature concerning the status of VDT research, recommendations resulting from research, and the positions of special interest groups revealed the following:

1. Radiation emission levels of all types have been proven to be below accepted standards of exposure. No association between radiation emissions and spontaneous abortions, birth defects, cataracts, or other injuries can be proven.
2. The most common problems reported with VDT use are visual complaints, musculoskeletal complaints, and stress-related complaints. At present, adverse health effects appear to be a result of ergonomic factors and can be solved by altering the mechanical design of equipment and improving management/employee relations.

3. Labor unions and special interest groups (SEIU and 9 to 5 especially) have advocated legislation to establish both equipment and labor standards. However, the National Research Council and others oppose mandatory standards, fearing poorly framed standards will lead to stagnation and inflexibility in addressing future issues. Those who oppose federal regulation suggest following ergonomic guidelines.
4. One of the foremost needs concerning VDT use is to provide educational material and programs for VDT users. Most companies rely on magazine articles rather than a structured program to educate VDT users about health and safety concerns.
5. Six states (California, Colorado, Massachusetts, New Mexico, Washington, and Wisconsin) have enacted laws establishing machine performance and ergonomic standards for VDT use. Although 30 states are considering such laws, Tennessee, Alabama, and Georgia have no pending legislation related to VDT use. (The Tennessee state legislature did appoint a committee to study the issues in 1986, but no action has resulted.)

#### Major Findings

Major findings presented are categorized as either ergonomic issues or health-related issues. Ninety-six VDT operators or persons responsible for VDT practices participated in the study.

## Equipment/ Ergonomic Issues

1. Only ten percent of the companies surveyed reported special policies related to health and safety of VDT users. Forty percent of the participants reported no communication of information about VDT safety and health issues, and 80 percent reported no specialized training.
2. Companies/manufacturers are implementing a significant number of the recommended ergonomic features into their workstation designs. Over 70 percent of the participants reported adjustable chairs (88 percent), movable keyboards (83 percent), swivel screens (71 percent), and adjustable brightness screens (81 percent).
3. Companies are implementing a significant number of the "add-on" features for the comfort and health of employees. Over 50 percent of the participants reported document holders (69 percent), anti-glare filters (53 percent), and noise-reduction covers for printers (52 percent).
4. Special lighting for VDT users is rare. Only 13 percent of the participants reported special lighting for their work station. Typical work station lighting is provided by the normal building lighting system with fluorescent lighting predominant (60 percent).
5. Green video display screens are being used at most (57 percent) locations.



## Health Issues

1. Common complaints of VDT users occur even though recommended guidelines are generally being implemented. Over 60 percent of the operators surveyed reported back pain, neck pain, headaches, and tension. These conditions were reported despite the fact that over 70 percent of the participants work at stations with adjustable keyboards, screens, and chairs.
2. Users of VDT terminals continue to associate vision changes that they experience with their use of the VDT. Thirty-four percent of the VDT operators reported significant vision changes since they began using the VDTs.
3. No company surveyed has special provisions for pregnant VDT users.
4. Rest breaks, although generally not a special provision for VDT users, are usually (82 percent) provided.
5. Alternate task breaks are provided for 62 percent of the VDT operators.
6. VDT users do not feel isolated from other employees. None of the participants reported this condition.
7. Keystroke monitoring is not common in this area. Only 11 percent of the participants reported this practice.

## Recommendations

1. Further long-term, large-scale research such as that proposed by NIOSH is needed since much of the research in VDT health issues remains inconclusive. The studies should determine whether

workers are satisfied with existing ergonomic recommendations and emphasize the stresses induced by VDT use.

2. Teach students about the possibilities of VDT dangers and emphasize the ergonomic design features and practices that are essential to prevent the hazards associated with VDT use.
3. Provide better on-the-job education and training including simple exercises, rest breaks, and other activities contained in the existing guidelines.
4. Companies should require vendors to include safety and ergonomic guidelines in vendor training pamphlets and training programs.
5. Companies should have VDTs checked periodically for radiation leaks.
6. Although the position of the medical community at the present time is that no health hazard exists if guidelines are followed, the medical profession should be encouraged to keep abreast of the health issues associated with VDT use.

APPENDIX A

APPENDIX A

Ergonomic Guidelines of NIOSH

## APPENDIX A

### *Ergonomic Guidelines of National Institute for Occupational Safety and Health (May, 1984)*

Recognizing the state of knowledge regarding ergonomic, stress and radiation issues in VDT work, NIOSH recommends the following general guidelines, which may require modification in specific situations:

(1) Workstation design: Maximum flexibility should be designed into VDT units, supporting tables, and operator chairs. VDTs should have detachable keyboards, work tables should be height adjustable, and chairs should be height adjustable and provide proper back support.

(2) Illumination: Sources of glare should be controlled through VDT placement (i.e., parallel to windows as well as parallel and between lights), proper lighting, and the use of glare control devices on the VDT screen surface. Illumination levels should be lower for VDT tasks requiring screen-intensive work and increased as the need to use hard copy increases. In some cases, hard copy material may require local lighting in addition to the normal office lighting.

(3) Work regimens: Continuous work with VDTs should be interrupted periodically by rest breaks or other work activities that do not produce visual fatigue or muscular tension. As a minimum, a break should be taken after 2 hours of continuous VDT work and breaks should be more frequent as visual, mental and muscular burdens increase.

(4) Vision testing: VDT workers should have visual testing before beginning VDT work and periodically thereafter to ensure that they have adequately corrected vision to handle such work.

APPENDIX B

Bell Telephone Lab Guidelines

## APPENDIX B

*Summary of Guidelines from Video Display Terminals: Preliminary Guidelines for Selection, Installation & Use prepared by Bell Telephone Laboratories, Inc. (1983).*

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### Design Guidelines for Positioning the Screen

1. The screen should be detached from the keyboard so that each can be positioned in an optimum location.
2. The distance from the eye to the screen should be adjustable from about 15 to 32 inches.
3. The screen should be tiltable from about 5 degrees forward to 15 degrees backward to help eliminate screen reflections.
4. The center of the screen should be positioned so that the viewing angle is 15 to 25 degrees below eye level.

### Design Guidelines for Tables

1. A fixed tabletop for typing should be about 27 inches high; for other tasks, it should be about 29 inches high.
2. The table top should be no thicker than 1 inch.
3. The space for the legs and feet under the table should be at least 27 inches wide and 27 inches deep.
4. Height-adjustable tables with a single surface should be adjustable from 25 to 30 inches above the floor. For dual-platform height-adjustable tables, the keyboard platform should be adjustable from 25 to 30 inches above the floor, and the screen platform should range from 26 to 32 inches high.
5. Height adjustment controls should be easy to reach and operate.
6. The surface of tables should be large enough to accommodate all task materials in addition to the VDT.
7. Small "wells" or recessed areas for the keyboard are *not* recommended. These restrict keyboard placement.
8. All edges and corners of the table, especially those under the surface, should be rounded for safety.
9. Visible surfaces should have a matte finish to reduce reflections.

### Design Guidelines for Chairs

1. The seat pan should be height-adjustable through a range 15 to 20 inches above the floor. If used by several operators, the chair should be easy to adjust.

2. The seat pan should be at least 16 inches wide, with a preferred width of 18 to 19 inches. The seat depth should not exceed 17 inches, with a preferred depth of 16 inches. The seat pan should tilt backward between 0 and 17 degrees.
3. The angle between the seat pan and seat back should be 100-120 degrees.
4. Seat padding should not compress more than one inch when an individual is seated.
5. The lumbar support should be centered 9 to 10 inches above the lowest point on the seat.
6. The front edge of the seat pan should be rounded downward.
7. The chair should be fitted with casters if the task requires the operator to get up or move around the workstation frequently. Be sure that the casters selected are appropriate for the office floor.

#### **Design Guidelines for VDT Accessories**

1. A wrist rest should be available for those who desire it.
2. A foot rest should be available for short operators, although it should not be necessary if both the table and the chair are height-adjustable. A foot rest should be approximately the same size as the seat pan. It should have non-slip surfaces and stand firmly on the floor.
3. For data entry and dialogue tasks, a document holder should be available. It should be adjustable in height and angle of tilt.

#### **Design Guidelines for the CRT Screen**

1. For rapidly changing displays, a short persistence phosphor (e.g., P4, bluish-white) is preferred. For fairly static images, P38 (orange) and P39 (green) are best. Avoid phosphor colors in the extreme ends of the visible spectrum (red, blue, and violet).
2. A 60 Hz refresh rate is adequate for most applications, but 70 Hz is preferred for short persistence phosphors and reversed video (light background) displays.
3. The use of light characters on a dark background or dark characters on a light background is mostly a matter of personal preference.

#### **Design Guidelines for Characters**

1. Users should be able to adjust the brightness of the characters. Adjustment controls should be located at the front of the screen.
2. The smallest acceptable dot matrix size is 5x7. Matrix sizes of 7x9 or 9x11 or larger are preferred.
3. A font should be selected that maximizes legibility. The Huddleston font provides legible 5x7 matrix characters.
4. Matrices with square dots, that fill more of the space in a character, are preferred over round and oblique dots.
5. Smaller characters and more densely packed text can be used for reading tasks. Larger characters and increased spacing should be used for visual search tasks and for typing material displayed on the screen.
6. The minimum character size should subtend 16-18 minutes of visual angle for reading and 22-24 minutes for visual search tasks.
7. Individual raster lines should be too close together to be seen as separate lines.
8. Lowercase letters with descenders that extended below the line are preferred to those with descenders above the line.



### **Design Guidelines for Keyboards**

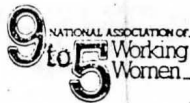
1. The keyboard should be detachable to permit flexible positioning of the keyboard and screen.
2. The keyboard should be as thin as possible and have a nonskid base to prevent sliding on the tabletop.
3. The keyboard angle should be between 5 and 15 degrees. Seven to 11 degrees is preferred.
4. Key surfaces should be concave to aid positioning of the fingers.
5. Key tops should have a matte finish to reduce specular reflections.
6. The keys should be approximately 0.5 to 0.6 inch square. The centers of the keys should be about 0.7 to 0.8 inch apart.
7. The keyboard should not feel either too stiff or too soft. An experienced operator can tell if the keyboard feels right. For reference purposes only, key force should be approximately 0.9 to 5.4 ounce and key travel between 0.003 and 0.2 inch.
8. Keys should have tactile (snap-action) feedback. Auditory (sound) feedback can be an advantage for unskilled users, but is not mandatory.
9. Use a QWERTY keyboard layout.
10. If numeric data entry is required, a separate numeric keypad should be provided.
11. The layout of keys on a numeric keypad should be the same as a touch telephone keypad.
12. Special function keys should be color-coded, distinctively shaped, or grouped together.

### **Design Guidelines for Office Illumination**

1. The best level of illuminance for VDT work that also uses paper documents is 300-400 lux. If paper documents are not used, the level of illuminance should be 200 lux or lower.
2. The VDT workstation should be oriented so that the operator does not face an unshielded window or a bright light source. The orientation of the video screen should be perpendicular or nearly perpendicular to the line of windows.
3. Windows should be covered with dark film, louvers, curtains, or blinds to attenuate or block bright sunlight.
4. Reduce specular reflections on the screen by using an etched screen surface, a thin-film coating, or a hood.
5. Reduce veiling reflections on the screen by using a neutral density filter or a micro-mesh filter.
6. The ceiling of the office should be a light color. The reflectance of the ceiling should be 80-90%, that of walls 40-60%, and that of floors 20-40%. Office furniture and machines should have a matte finish with a reflectance of 25-50%.

APPENDIX C

Pending Legislation



NATIONAL ASSOCIATION OF  
Working Women  
614 Superior Ave. N.W.  
Cleveland, OH 44113  
(216) 566-9308

STATE EXECUTIVE AND LEGISLATIVE ACTION ON VDT HEALTH AND SAFETY

-1985-

STATE	SPONSOR/NO.	MISC.	PASSED	STUDY	EDUCATION/ TRAINING	EXAMS	LENSES	LIGHTING	TESTING INSPECTIONS	GLARE SCREENS/ HOODS	ACOUSTICS	RADIATION SHIELDING	ADJUSTABLE EQUIPMENT	REST BREAKS	TIME LIMITS	MEDICAL/ PREGNANCY TRANSFER	MONITORING
CA	Greene, SB-612	State authority to regulate															
CA	Hayden, AB-687	Guidelines															
CA	Hayden, AB-1006				X	X	X	X	X	X	X		X	X			
CA	Hayden, Brown AR-76	Supporting Office of Information Technology Guidelines							X								
CA	Floyd, AB-1079	Univ. of CA employees covered															
CA	Office of Infor- mation Technology	Ergonomic Guidelines	X							X			X				
CO	Peterson				X												
CT	Adamo	Guidelines			X	X											
CT	Shelly Casey, Kiner, Adamo				X	X			X					X			
IA	Bruner, SB-322				X	X	X	X	X	X	X	X	X	X	X	X	X
IA	HB-329				X	X	X	X	X	X	X	X	X	X	X	X	X
IN	Jontz, B-526				X	X	X	X	X	X	X	X	X	X	X	X	X
MA	D'Amico, SB-1436	Medical Advisory Board					X	X	X	X	X	X	X	X	X	X	X
MD	Perkins, Kreamer Harrison HB-1258				X	X	X	X	X	X	X	X	X	X	X	X	X
MN	Petty, Lantry Peterson SB-315	Ergonomic Guidelines				X	X							X			
MO	HB-406				X	X	X	X	X	X	X	X	X	X	X	X	X
NJ	Walker, AR-132	Study Taskforce		X													
NM	Anaya Exec Order 85-11	Review Committee	X		X	X*		X		X	X		X	X		X	
NY	Barbaro, A-6707				X	X	X	X			X		X	X		X	
NY	Gottfried A-7053	State purchasing guidelines								X			X				



APPENDIX D

Cover Letter

Kay T. Wilkey  
Route 1 Box 166  
Bridgeport AL 35740

June 19, 1987

Dear Participant


I am enrolled in the Master of Education (Business) program at the University of Tennessee at Chattanooga. As a course requirement I am researching current office practices related to the use of video display (computer or word processing) terminals (VDTs). Based on the results of this research, we can determine whether additional recommendations are necessary to resolve the ergonomic and safety issues related to VDT use.

This study is being conducted under the auspices of The University of Tennessee at Chattanooga. The results will be summarized with no company names listed, therefore, confidentiality of your response is assured.

Please complete and return the enclosed questionnaire in the stamped pre-addressed envelope by June 27, 1987.

I will send you a copy of the results summary if requested.

Sincerely



Kay T. Wilkey

ktw

Enclosures

## APPENDIX E

### Survey Instruments



## VIDEO DISPLAY TERMINAL OPERATOR INTERVIEW GUIDE

Company Name \_\_\_\_\_

Company Address \_\_\_\_\_

Name of Employee \_\_\_\_\_ Phone No. \_\_\_\_\_

Position Title: \_\_\_\_\_

Brief Description  
of VDT function \_\_\_\_\_

### EQUIPMENT

- I have used VDT equipment  
 less than 6 months     1-2 years  
 6-12 months         more than 2 years
- Indicate percent of employee's time spent using VDT's (over 4 hours/day minimum:  
 4-5     5-6     6-7     7-8     over 8
- Are the VDT users at your company represented by a union?  
 yes                       no
- Does any portion of the collective bargaining pertain to VDT use?  
 yes                       no                       not applicable (no collective bargaining)
- Who in your company keeps current on VDT safety and ergonomic issues?  
\_\_\_\_\_
- Indicate the number of VDTs/printers in your work area:  
Terminals:  1-5     6-10     11-15     16-20     over 20  
Printers:     1-5     6-10     11-15     16-20     over 20
- Briefly describe the VDT work station space (indicate rooms, cubicles, desk tops of individual operators, etc.):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- Type of lighting used where VDT is located:  
 diffused                       incandescent                       fluorescent  
 direct                               indirect                               other (specify: \_\_\_\_\_)
- Indicate special equipment purchased for VDT stations:  
VDT tables:  adjustable height controls  
                   non-adjustable (indicate height: \_\_\_\_\_)  
Chairs:         adjustable height  
                   adjustable back support  
                   non-adjustable  
Foot rests     provided     not needed     needed but not provided  
Wrist/arm rests  provided     not needed     needed but not provided

Document holders:  provided  not needed  not provided  
(if provided location is:  on left  on right  front of keyboard  
Movable keyboard:  provided  not provided  
Palm rest :  provided  not provided  
Keyboard finish :  glossy  matte  
Screen :  adjustable  non-adjustable

10. Provided that screen is adjustable, please indicate:  
 tilt angle (degrees)  
 height adjusted so that screen is (eye level, above eye level, below eye level)
11. Color of screen:  amber  green  black on white  white on black  blue  
 other (specify \_\_\_\_\_)
12. Glare is reduced by:  panel  screen  tilt  none provided
13. Are employee suggestions solicited regarding the type of VDT's installed in your department?  
 yes  no
14. Indicate any of the following that are provided?  
 Matte finish walls  
 Specially designed louvers or other lighting devices to reduce glare  
 Adjustable brightness screens  
 Anti-glare screen filters  
 Noise reduction covers for printers  
 Other specific measures to reduce glare (specify: \_\_\_\_\_)

## HEALTH

1. Does your company have any health or safety policies specifically for VDT users?  
 yes  no
2. Are VDT operators entitled to rest breaks?  
 yes  no  
\_\_\_\_\_ number of rest breaks  
\_\_\_\_\_ approx. length of breaks (minutes)  
\_\_\_\_\_ interval between breaks (approximate)  
 mandatory  optional
3. Are you provided with alternate task breaks to limit continuous VDT use?  
 yes  no
4. Do you feel isolated from other employees (as a VDT user)?  
 yes  no
5. Are your keystrokes monitored by the equipment you use in your job function?  
 yes  no
6. Are periodic eye examinations required?  
 yes  no

(Eye examinations paid for by:  
 company

individual  
 company-provided health insurance)  
(If occupational eyewear is required, it is paid for by:  
 company  
 individual  
 company-provided health insurance)

7. Last eye examination occurred:  
 less than 6 months     6-12 months     1-2 years     over 2 years

8. Was there any significant change in vision:  yes     no

9. Are there any special provisions for pregnant VDT users?  
 yes (describe briefly)     no

---

---

---

10. Indicate any of the following that you have experienced:  
 neck pain     back pain     headaches     tension

11. Provided that pain/tension has occurred, has it increased during:  
 less than 6 months     6-12 months     1-2 years     over 2 years

12. Indicate how VDT-related health and safety information is communicated to employees?  
 memos  
 newsletter  
 educational pamphlet  
 bulletin boards  
 safety meetings  
 other (describe) \_\_\_\_\_  
 none has been communicated

13. Do you provide any training of any kind (which addresses possible safety/health aspects of VDT use)?  
 yes     no

# QUESTIONNAIRE FOR VIDEO DISPLAY TERMINAL OPERATOR

date transmitted \_\_\_\_\_

date received \_\_\_\_\_

## GENERAL/EQUIPMENT

1. Company has used VDT equipment  
 less than 6 months     1-2 years  
 6-12 months         more than 2 years
2. Indicate percent of employee's time spent using VDT's (over 4 hours/day minimum):  
 4-5     5-6     6-7     7-8     over 8
3. Are the VDT users at your company represented by a union?  
 yes         no
4. Does any portion of the collective bargaining pertain to VDT use?  
 yes         no         not applicable (no collective bargaining)
5. Who in your company keeps current on VDT safety and ergonomic issues?  
\_\_\_\_\_  
\_\_\_\_\_
6. Indicate the number of VDTs/printers in your work area:  
Terminals:  1-5     6-10     11-15     16-20     over 20  
Printers:     1-5     6-10     11-15     16-20     over 20
7. Briefly describe the VDT work station space (indicate rooms, cubicles, desk tops of individual operators, etc.):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. Type of lighting used where VDT is located:  
 diffused         incandescent         fluorescent  
 direct         indirect         other (specify: \_\_\_\_\_)
9. Indicate special equipment purchased for VDT stations:  
VDT tables:  adjustable height controls  
                   non-adjustable (indicate height: \_\_\_\_\_)  
Chairs:         adjustable height  
                   adjustable back support  
                   non-adjustable  
Foot rests     provided     not needed     needed but not provided  
Wrist/arm rests  provided     not needed     needed but not provided  
Document holders:  provided     not needed     not provided  
                  (if provided location is:  on left     on right     front of keyboard  
Movable keyboard:  provided     not provided  
Palm rest :     provided     not provided  
Keyboard finish :  glossy     matte  
Screen :         adjustable     non-adjustable
10. Provided that screen is adjustable, please indicate:  
 tilt angle (degrees)  
 height adjusted so that screen is (eye level, above eye level, below eye level)
11. Color of screen:  amber     green     black on white     white on black     blue  
                           other (specify \_\_\_\_\_)
12. Glare is reduced by:  panel     screen     tilt     none provided
13. Are employee suggestions solicited regarding the type of VDT's installed in your department?  
 yes     no
14. Indicate any of the following that are provided?  
 Matte finish walls  
 Specially designed louvers or other lighting devices to reduce glare  
 Adjustable brightness screens  
 Anti-glare screen filters  
 Noise reduction covers for printers

— Other specific measures to reduce glare (specify: \_\_\_\_\_)

### HEALTH

1. Does your company have any health or safety policies specifically for VDT users?  
— yes — no
2. Are VDT operators entitled to rest breaks?  
— yes — no  
\_\_\_\_\_ number of rest breaks  
\_\_\_\_\_ approx. length of breaks (minutes)  
\_\_\_\_\_ interval between breaks (approximate)  
— mandatory — optional
3. Are VDT operators provided with alternate task breaks to limit continuous VDT use?  
— yes — no
4. Have VDT users complained of being isolated from other employees (as a VDT user)?  
— yes — no
5. Are VDT operator keystrokes monitored by the equipment they use in their job function?  
— yes — no
6. Are periodic eye examinations required?  
— yes — no

(Eye examinations paid for by:

- company
- individual
- company-provided health insurance)

(If occupational eyewear is required, it is paid for by:

- company
- individual
- company-provided health insurance)

7. Have there been any cases of significant change in vision for VDT users: — yes — no
8. Are there any special provisions for pregnant VDT users?  
— yes (describe briefly) — no

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9. Indicate any of the following that VDT users have experienced:  
— neck pain — back pain — headaches — tension
10. Indicate how VDT-related health and safety information is communicated to employees?  
— memos  
— newsletter  
— educational pamphlet  
— bulletin boards  
— safety meetings  
— other (describe) \_\_\_\_\_  
— none has been communicated

11. Do you provide any training of any kind (which addresses possible safety/health aspects of VDT use)?  
— yes — no

YOUR TIME AND COOPERATION ARE SINCERELY APPRECIATED

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