

/LIGHTING EFFECTS ON VIDEO DISPLAY TERMINALS/

by

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## INTRODUCTION

Video display terminals (VDTs) are still new to the workplace and their use is quickly increasing. It is estimated that during the year 1985 over 75% of all office jobs will involve computers in some way, thus making the VDT commonplace (Shaffer, 1981). With the elements of the traditional office changing in this manner, the adequacy of traditional office equipment, furniture, and design must be re-examined to consider the computerized office system (Springer, 1980). Most terminals have been placed into already existing conditions without being certain they are set up for maximum productivity or comfort.

Since VDTs were introduced to the workplace the interest in their use has been growing. With this growing use, an interest was also produced in increasing the productivity of the users. This produced studies that focused on various aspects of the workplace for electronic systems in an office. Studies have been done on the various components of the workplace and this study focused on the aspect of lighting. Few studies have been done to find the best lighting for the VDT.

A study at the University of Colorado by Harvey, Mistrick, DiLaura, and Ngai (1984) found a preference for indirect lighting in which the subject was tested in each condition. This study did not find a statistical difference in the productivity of the tasks. Two studies at Kansas State University, one by Miller (1985) and the other by Kendrick and Harris (1985) found a preference for task with indirect lighting, but found no significant differences in the performance between it and direct lighting. Both of these studies were conducted with each subject

being under each condition.

IBM is a large producer of VDTs and takes an interest in the best workplace for them. IBM sponsored a study by Kansas State University focusing on the problem of lighting. This was done to study the effects on worker performance and to see how the worker felt about the lighting and the glare produced by the lighting conditions.

The workplace consisted of an office with an adjustable work station and an IBM Personal Computer. The work station was adjustable various ways. One form of adjustment was the height and angle of the keyboard and of the video terminal. The document holder was one that held the document to the side of the screen and could be moved by the operator. The chair for the operator was also adjustable for height.

The variable was the lighting. The types of lighting were "diffuse", "louvered", and "kiosk/task" lighting. The lights were changed in a random manner and each subject was run under only one of the three conditions.

## METHODS

### Lighting

Diffuse lenses on lights are used to spread the light evenly over an area. This is done by having prismatic surfaces on the lens that send the light in differing directions. This type of lens is placed on ceiling lights. These are the type that are in many offices at the present. (See Figure 1.)

Louvered lights are used to direct the light down into an area without spreading it out and are placed to reduce the amount

of glare in a particular place, such as the screen. The louvers are similar to "egg crating" in design. The spacing of this cross-hatching can be large or small and effects how much the light is allowed to spread out. In this experiment a large space (5.5 X 7 inches) cross-hatching was used on the ceiling lights. (See Figure 2.)

Kiosk lights are a form of indirect lighting that reflect light off the ceiling. They are placed so the light is spread evenly over the ceiling which, in turn, spreads the light evenly over the work area. Unlike ceiling lights, they shouldn't have a definite shape of the light source from the ceiling. This may help reduce the problem of reflected light, since no distinct shape is visible. Task lighting was used with the kiosk to assure the source document was adequately lit. (See Figure 3.)

#### Test Room

The workplace was set up to simulate an office situation (see Figure 4). It was set up in the Kansas State University video display terminal laboratory which is designed for this purpose. The room is 10.5 ft. X 32 ft. X 8 ft. It is furnished with a brown carpet. The walls have been painted an off-white color. Plants are placed in the room for added aesthetics. The white suspended ceiling is designed for ease of changing lights.

The workplace consisted of an adjustable work table, an adjustable chair, and partitions to set it apart from the other areas of the room as in an office. The partitions were approximately the same color as the walls of the room. They are 42 in. tall and defined a work area of 7 ft. X 8 ft.

The table could be adjusted for the VDT height, the height

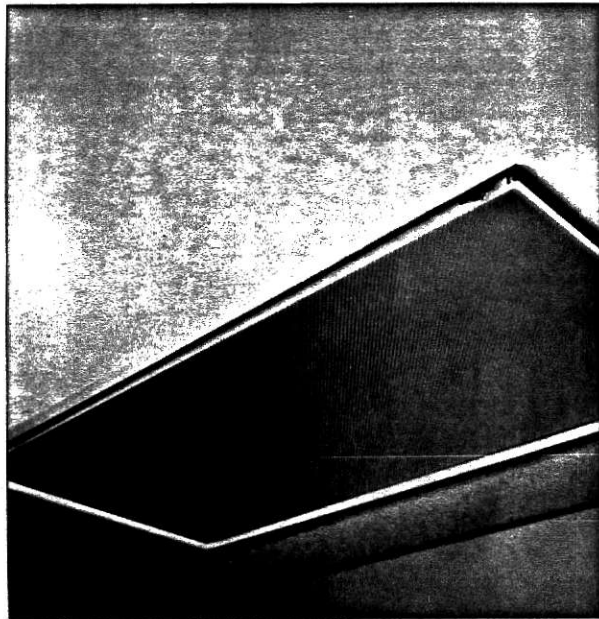


Figure 1. Diffuse lighting.



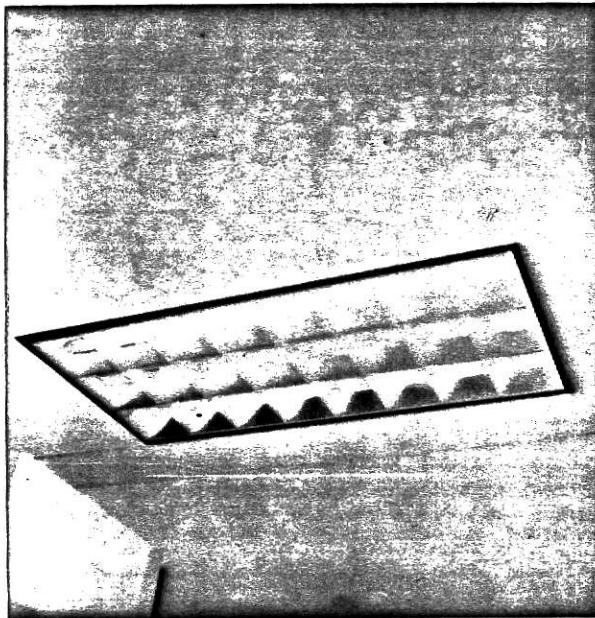


Figure 2. Louvered lighting.



Figure 3. Kiosk lighting



Figure 4. Workplace.

of the keyboard, and the position of the source document holder. The VDT was set on a part of the table that could be adjusted, up and down, foreward and back, and the angle of the VDT. The keyboard was placed on a part of the table that would raise and lower the sides and the front of the keyboard separately from each other. The computer was placed on the table to the side of the operator and on its side to take up a minimal amount of space and to be out of the way of the operator. The table was an off-white color. Each of these adjustments was made for the comfort of the subject before the experiment started.

The chair had castors. The seat was adjustable for the height of the operator. The back of the chair was adjustable for pressure on the back and could be moved forward or backward so the operators' legs would be comfortable.

#### Procedure

The tasks for this experiment were used to simulate work the subject would be doing in an office situation. One task was data entry and the other was checking data that was already entered. Each subject was used in only one lighting condition to avoid the effects of learning. The lighting conditions were changed randomly to avoid serial effects. The subjects were not tested ahead of time so their abilities were unknown until the experiment. Therefore they were assigned randomly to the lighting conditions.

Before the experiment, the subject first was given an oral statement about the reason for the experiment. Next, the subject was asked to read and sign a consent form (see Figure 5) and answer some background questions. (See Figure 6.) The

INFORMED CONSENT FORM

I, \_\_\_\_\_, understand that the experiment I am about to participate in requires that I participate in several tasks designed to test my perceptual speed and accuracy. The specific tasks involve comparisons of two sets of data, entering data into the computer, tracing over geometric figures, and answering questions about my experiences while participating in this experiment. This experiment will last approximately one (1) hour and I will be paid (10) dollars for my participation. There are no foreseeable risks or discomforts involved in my participation in this research. I understand that my records will be kept anonymous and that my participation is voluntary and I may withdraw from participation at any time without penalty. If I have any questions or concerns about this study, I can contact Dr. Corwin Bennett at 532-5607.

If you understand the above and give your consent to serve as a subject, please write the date and your signature below.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

Figure 5. The consent form.

## Background Questions

1. Sex: Male \_\_\_\_\_ Female \_\_\_\_\_
2. Age (in years): \_\_\_\_\_
3. Have you ever used video display terminals on the job? \_\_\_\_\_  
If yes, what percentage of your time on the job was spent with  
video display terminals? \_\_\_\_\_
4. Have you ever worked as a typist? \_\_\_\_\_ If yes, for how  
long (in years)? \_\_\_\_\_ What percentage of your time was spent  
typing? \_\_\_\_\_
5. What is your best estimate of your typing speed (in words  
per minute)? \_\_\_\_\_

Figure 6. Background questions.

background questions asked about the subjects past typing experience and an estimate of their typing speed. The work station then was adjusted to the comfort of the subject. This included adjustment of the VDT, the keyboard, document holder, and chair if desired by the subject.

The first task was the Minnesota Clerical Test (MCT). It is a standard test for clerical workers. It is used to test manual dexterity and perceptual speed. Standards have been developed for its use and it is used to select clerical personnel (Super and Crites, 1960).

It was adapted to use on the computer and consisted of two parts. The first part was a number comparison task with a list of numbers on the VDT and a list of numbers on a source document that were to be compared. (See Figure 7.) The numbers that were identical were to be marked on the computer by using the keyboard and placing a letter on the blank in front of the number. It was performed for eight minutes. The second part was a word comparison task that was to be performed in the same manner as the number comparison and was to be performed for seven minutes. The subject used the Borg scale (see Figure 8) to rate the difficulty of the task after finishing it. This was done by circling the number beside the difficulty description that best described how they felt about the task.

Source Document

VDT

3428910  
57629  
3895762594

\_\_\_\_\_ 3429910  
\_\_\_\_\_ 57829  
x \_\_\_\_\_ 3895762594

Figure 7. Example of MCT task. The source document entries were right justified and the VDT entries were left justified.



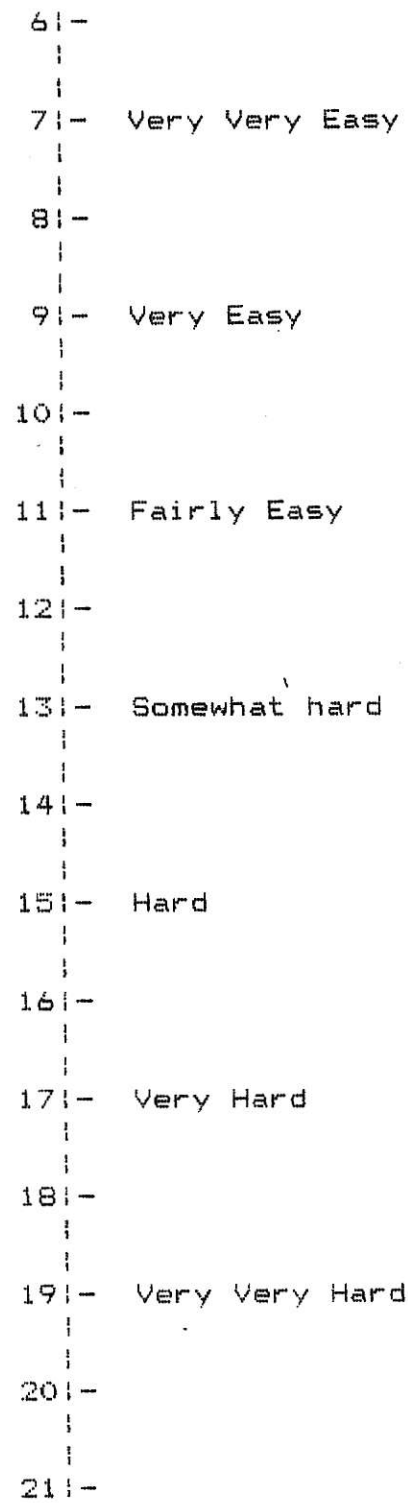


Figure 8. Borg perceived exertion scale.

The second task simulated filling in an application blank on the VDT from a source document. This task will hereafter be called the "interactive test". It was a clerical type task that required typing from a source document to the VDT. This task was developed for another experiment that was done for bifocal use with VDTs (Bennett, Levett, Silver, Loogsen, and Eckhoff, 1984). The blank on the screen (see Figure 9) and the information on the source document (see Figure 10) were not in the same order. Thus, the subject had to continually look back and forth from the screen to the document. The subjects were given an instruction sheet that told how to fill in the application blanks and the location of some keys they would be using. (See Figure 11.) The subject was allowed to practice this task by filling out one blank. Fifteen minutes were allotted for the performance of the interactive task. The difficulty of this task was rated using the Borg scale.

The rest of the session consisted of the Feather test and follow up questions. The Feather test is a test designed to check the amount of stress a person was under at the time. This task consists of four puzzles. (See Figure 12.) The first and third puzzle are impossible, but the second and fourth are possible. The subject was allowed to take as much time as they wanted and to try each puzzle as many times as they wanted. The follow up questions (see Figure 13) were asked to see how the subject felt about the lighting and possible discomfort they may have encountered. The length of a test session was approximately one hour per subject.

```

*****
* Joe Cool Application:                                     *
*                                                         *
* Name _____                                         *
*      First           MI           Last                   *
*                                                         *
* Home Town _____                                     *
*      City           State         Street                 *
*                                                         *
* Manhattan Address _____                             *
*                   Street                                     *
*                                                         *
* Present Phone _____ College                         *
*                   Standing _____ YR           Major *
*                                                         *
*****

```

Figure 9. Blank as it appeared on the screen for the interactive test.

Carlson, Jack Edward ..... 537-8227 2412 Rebecca Rd. Manhattan, Ks (FR CNS)	Carr, Cheryl Jean ..... 9215 W. 112th Terr. Overland Park, Ks. (FR ASUN)
Carlson, Julie Anne ..... 1407 Anderson (FR INTDE) 9336 Briarwood Court, Wichita, Ks	Carr, Dana R. .... 532-2164 104 Boyd Hall (JU ACCTG) 3173 Rowland, Kansas City, Ks
Carlson, Kelley S ..... (FR ASUN) 3106 Gary Ave. Manhattan, Ks	Carr, James Patrick ..... 539-8482 1106 Kearney (SR CNS) 4117 W 73rd Terrace, Prairie Village, Ks
Carlson, Kelly Rae ..... 539-1281 350 N 16 St Apt 5 (JU JMC) Route 2, Wamego, Ks	Carr, Karen L. .... 539-4883 601 Fairchild Terr (FR ASUN) 131 Brendonwood Dr. Wichita, Ks
Carlson, Lance Harry ..... 537-3178 1304 N Manhattan (GM ARCH) 591 Maple Lane, Elk Grove, Il	Carr, Kelli Ann ..... 776-1886 1530 McCain Ln Apt 5 (SO EDPPE) 4205 N. 124th St. Kansas City, Ks
Carlson, Marguerite Williams ..... 776-7725 745 Canfield Dr. (NG ZZZZZ) 745 Canfield Dr. Manhattan, Ks	Carr, Kimberly Denise ..... 776-6888 918 Denison Apt 7 (SR APDES) 2503 N 59th Terrace, Kansas City, Ks
Carlson, Marty Jo ..... 539-2381 1834 Laramie (SR FLHD) 9805 Connell, Overland Park, Ks	Carr, Marilyn Kay ..... 776-6874 1530 McCain Apt 3 (SR GENBA) 3800 Oak Parkway, Topeka, Ks
Carlson, Randall Cre ..... 776-3135 423 Vattier (SR GEOL) 423 Vattier, Manhattan, Ks	Carr, Mark W. .... 776-3128 1010 1/2 Laramie (SR ET) 2018 Hood St. Wichita, Ks
Carlson, Ronda Kay ..... 537-4811 813 Moro St (JU PDP) Rt 6 Casement Rd. Manhattan, Ks	Carr, Robert Harold ..... 776-4887 Rt 2, Box 443 (SR PSYCH) 324 East 13th, Baxter Springs, Ks
Carlson, Terri Lynn ..... 776-4488 213 Redbud Est (SR PE) 4121 E 30th, Hutchinson, Ks	Carr, Trent G ..... 532-5389 533 Goodnow Hall (SO PDP) 1822 North Webster, Liberal, Ks
Carlton, Dawn Lane ..... 776-8817 RR 3 Box 303 (FR RFL) Route 3, Box 303, Manhattan, Ks	Carrs, Douglas A ..... 539-1475 924 Fremont #4 (JU ANTH) RR 1, Niotaze, Ks
Carmenate, Nadine ..... 539-5888 925 Denison Ave (JU EE) Cereso No 102, Rio Piedras, Pr	Carrasco, John Cruz ..... 776-3288 U-5 Jardine Terr (SR POLSC) 1508 Fairchild, Manhattan, Ks
Carmichael, Bert Adam ..... (SO CMPSG) 908 E. 32nd Ave. Hutchinson, Ks	Carrick, Bradley Dean ..... 373-6479 1711 Valley Glenn Rd (JU EE) 1711 Valley Glenn, Topeka, Ks
Carmichael, Dehl R ..... 539-8763 1100 Fremont (JU ARCH) 4255 Auburn, Wichita, Ks	Carrigan, Jean Ann ..... 238-1772 911 Skyline (GM EDAO) 911 Skyline, Junction City, Ks
Carmichael, Scott K ..... 539-2381 1425 University Dr (FR PSYCH) 201 W Wilson, Salina, Ks	Carrigan, Lori Lynn ..... 539-4883 601 Fairchild Terr (SO JMC) 613 E. Leslie, Salina, Ks
Carnahan, Sheryl E ..... 532-3331 913 Ford Hall (JU FLHD) RR 1, Wamego, Ks	Carrigan, Scott Arthur ..... 539-4285 519 N Manhattan Apt4 (JU ASUN) 613 E Leslie, Salina, Ks
Carnel, Owen Haskins Jr ..... 532-3438 230 Haymaker Hall (SR PDP) 44137 28th St West, Lancaster, Ca	Carriven, Connie J ..... 539-1828 1807 College Hgts #7 (SO ARTF) PO Box 157, Lewis, Ks
Carnes, Carol Jean ..... 776-1447 815 Bluemont (GP ECON) RR 1, Weir, Ks	Carrroll, Amy Marie ..... 539-7571 1835 Todd Rd (FR JMC) 2510 Lincoln, Great Bend, Ks

Figure 10. Sample of source document for the interactive test.

**\*\* INSTRUCTIONS \*\***

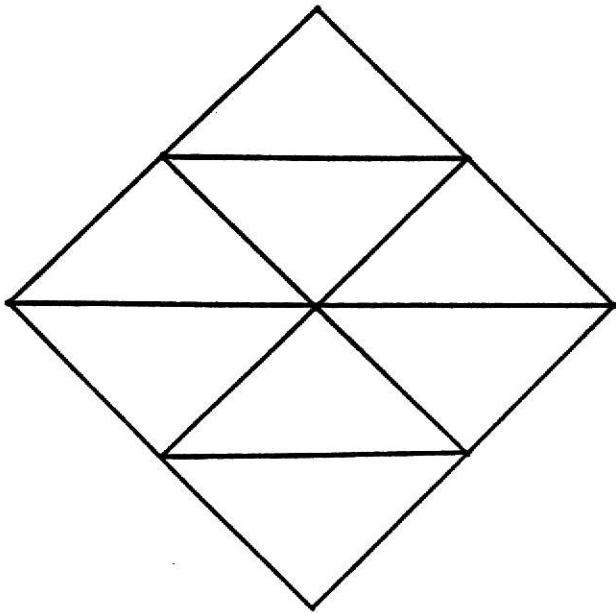
Placed in front of you is a VDU with the JOE COOL SOCIETY application forms on the screen. You have also been provided a page of the Student Directory. Fill in the necessary information on the applications. All necessary information is provided by the directory. If information is asked for, but not supplied, simply move on to the next piece of provided information.

Typing in the desired information will replace the line with the typed in character, do not worry. The lines are provided for screen orientation purposes only! Please follow the placement format, as specified on the application, as closely as possible.

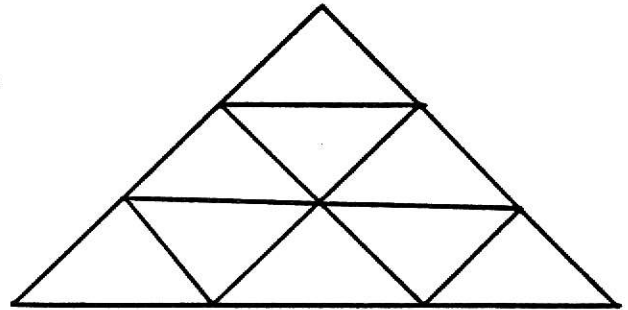
The upper case keys (2) are indicated by an outlined arrow. The one for the right hand is just above the caps lock key and the one for the left hand is right above the alt key. In order to move the cursor simply press the space bar. This will move you forward in addition to erasing the characters the cursor typed over. In order to move in any direction, without erasing previously done work, use the arrows on the numeric pad on the right hand side of the keyboard. The arrows move in the direction they point to. Also, if desired, pages can be scrolled up or down with the PGUP and PGDN commands on the numeric pad. Please Type in the Directory Information Exactly as it Appears!

Take some time to get situated. Practice a few names, become familiar with what the computer is capable of doing. If you have any questions, now or later, do not hesitate to ask.

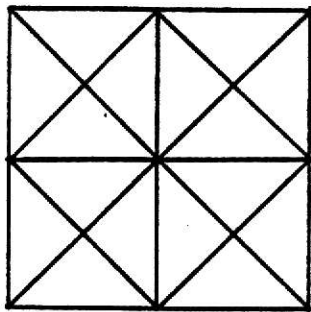
Figure 11. Instructions for interactive task.



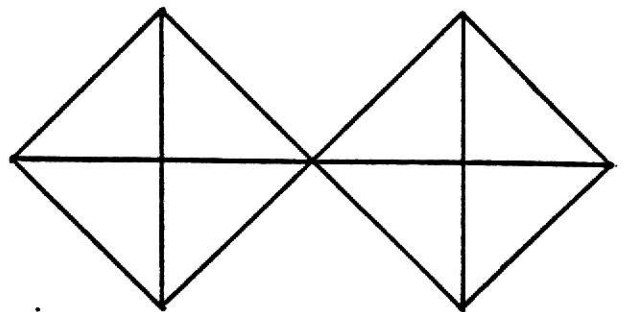
Possible



Possible



Impossible



Impossible

Figure 12. Feather test puzzles.

Follow-up Questions

1. Did you feel comfortable with the lighting conditions during this experiment? \_\_\_\_\_ Please explain \_\_\_\_\_

2. The lighting conditions during this experiment were:

- \_\_\_\_ (1) Much too bright
- \_\_\_\_ (2) A little too bright
- \_\_\_\_ (3) Just right
- \_\_\_\_ (4) A little too dim
- \_\_\_\_ (5) Much too dim

3. Did the level of brightness affect your performance? \_\_\_\_\_  
If yes, please explain: \_\_\_\_\_

4. Did you notice any reflected glare while you operated the video display terminal? \_\_\_\_\_ If yes, do you feel that it affected your performance? \_\_\_\_\_ How? \_\_\_\_\_

5. Did you experience any discomfort while using the video display terminal?

- |          |           |          |
|----------|-----------|----------|
| Eyes     | Yes _____ | No _____ |
| Neck     | Yes _____ | No _____ |
| Back     | Yes _____ | No _____ |
| Buttocks | Yes _____ | No _____ |
| Thighs   | Yes _____ | No _____ |
| Calves   | Yes _____ | No _____ |
| Feet     | Yes _____ | No _____ |

If you answer yes to any of these items, please explain. \_\_\_\_\_

6. Describe any other discomfort you had while operating the video display terminal.

7. Please describe any other problems which you may have had.

Figure 13. Follow-up questions.

## Subjects

Subjects were recruited for this experiment on the belief they were the type that has worked with VDTs or may work with them in the future. The subjects were required to be able to type at least thirty words per minute.

Recruitment was done by the local job service office. Subjects were to be paid six dollars for their participation. A problem was encountered with subjects not showing up and people not signing up for the experiment. It was then decided to pay the subjects ten dollars for their participation and to advertise in a local paper. This solved the problem and enough subjects were found.

Sixty subjects were run with 20 being run in each of the three lighting conditions; 28 of the subjects had prior experience with VDTs and 38 had worked as typists. The range in age was from 17 to 57 with a mean of 26.2. Of the 11 male subjects 5 used the louvered lighting, 1 used the diffuse lighting, and 5 used the kiosk/task lighting.

## RESULTS

The results from seven different areas were studied, using an analysis of variance in SAS programming. Only one area was found to have a significant difference at the five percent level. (See Figure 14.) The means and standard deviations for these areas are shown in Table 1. For the MCT, the performance score and the Borg score were studied. There was no significance for either of these measures. There were four criteria for the interactive task. These were the number correct, number wrong, total done, and the Borg score. There was no significant



difference among the lighting conditions for these measures. The number correct and the number wrong were not significantly different.

The area that had a significant difference was the light rating. This was taken from the follow up question sheet. The subjects were asked to rate the lighting on a scale from "one" to "five" for the brightness. The "one" rating meant the lighting was much too bright and "five" meant it was much too dim, while "three" meant it was just right. The means showed the kiosk/task lighting was significantly different from the other two systems. These two systems were not significantly different from each other. The kiosk/task lighting was considered to be dimmer than the other two, which had almost identical averages. The kiosk/task lighting was much less than the others. This level was 344 lux. The diffuse and louvered levels were 1270 and 1184 lux, respectively.

From the follow-up questions, it was determined that the subjects felt the lighting was comfortable. Overall 50 of the 60 felt comfortable with the lighting. Each condition had a fairly equal amount of comfort.

Fewer people felt the kiosk/task lighting had a level of brightness that affected their performance. This data was obtained from question three of the follow-up questions. Of the 13 overall that felt the brightness did affect performance, only one was from the kiosk/task group and he felt the lighting was dim. The diffuse group had six that felt their performance was affected and of these six, five felt their performance was

enhanced due to good lighting conditions. The six in the louvered group were mostly complaints.

Question four found 30 percent of the subjects noticed glare from the VDT and a third of these felt it affected their performance. Eight of the 18 that noticed the glare were in the kiosk/task group, but only one felt his performance was affected. The other two groups each had five notice the glare, with three from the diffuse group and two from the louvered group feeling their performances were affected.

Twenty-six said they felt a discomfort in their eyes from the experiment. Table 2 shows this data. The distribution was fairly even among the groups with nine from each of two groups and eight from the other. The other most common physical complaint about the experiment was a sore neck. Fourteen subjects cited this. Of the fourteen, six were from the diffuse group. The other groups had four complaints apiece. The next problem area was the back. It had a total of six subjects say it was an area of discomfort for them. Three were from the kiosk/task group, two were from the louvered group, and one was from the diffuse group. The other areas they were questioned about only had three at the most as a whole group.

Dependent Variable: INTERACTIVE TOTAL

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	1340.63	670.32	0.81	0.45

Dependent Variable: INTERACTIVE CORRECT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	826.43	413.22	0.46	0.63

Dependent Variable: INTERACTIVE ERROR

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	63.10	31.55	0.41	0.66

Dependent Variable: INTERACTIVE BORG

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	1.43	0.72	0.15	0.86

Dependent Variable: MCT SCORE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	3261.10	1630.55	1.29	0.28

Dependent Variable: MCT BORG

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	0.43	0.22	0.07	0.93

Dependent Variable: LIGHT RATING

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR >
Light Type	2	7.03	3.52	7.85	0.00

Figure 14. ANOVA tables for analysis of the seven areas.

Table 1. Analysis Statistics

	Mean	Std Dev	Difference
DIFFUSE			
Interactive			
Total	93.60	30.05	
Correct	82.10	32.64	
Errors	11.50	10.84	
Borg	13.50	2.72	
MCT			
Score	144.45	34.52	
Borg	11.05	1.90	
Light rating	2.70	0.57	***
LOUVERED			
Interactive			
Total	95.25	29.98	
Correct	83.70	28.58	
Errors	11.55	7.80	
Borg	13.80	2.04	
MCT			
Score	141.65	31.08	
Borg	11.00	1.56	
Light rating	2.65	0.75	***
KIOSK/TASK			
Interactive			
Total	84.50	26.26	
Correct	75.15	28.92	
Errors	9.35	7.36	
Borg	13.85	1.63	
MCT			
Score	127.60	40.33	
Borg	10.85	1.73	
Light rating	3.40	0.68	***

\*\*\* - denotes significant difference. The kiosk/task is different from the diffuse and louvered which may be the same.

## DISCUSSION

The reading for the level of light on the work station was taken from a point in front of the keyboard. The kiosk/task lighting was much less than the others. This level was 344 lux. The diffuse and louvered levels were 1270 and 1184 lux, respectively. This would account for the subjects feeling the room was dim in the kiosk/task lighting. The other lighting systems are more common and this would be what most are used to being in. The lighting levels from the screen were close to the same for all conditions. This reading was taken to determine the amount of light and glare the operator received from the screen. For the kiosk/task, the level was 172 lux and for diffuse and louvered it was 237 lux. The lighting for the source document was 753 for the kiosk/task, 646 for the diffuse, and 592 for the louvered lighting. This reading was taken to determine the amount of light the operator was receiving from the source document. This could account for the statements about the source document being "bright". Some of the subjects felt the difference in lighting between the screen and the document kept their eyes adjusting to the difference in brightness.

The most common stated discomfort was the eyes. Table 2 shows the areas of discomfort and the number for each. This may be attributed to most of the subjects lack of consistent use of VDTs. Though 28 had experience working with VDTs, most did not use them consistently. A common statement about this complaint was the difference in brightness of the screen and the source document. Many felt the white paper used as a source document made it bright and caused fatigue on the eyes.

The next two areas of discomfort were the neck and back. The lighting may have produced glare the operator was unaware of because he adapted a poor posture to avoid the glare. Reflections can cause fatigue by forcing VDT operators to adopt unusual postures to keep reflections outside critical display regions on the screen (Grandjean, 1980).

The other areas of discomfort did not have many responses and were usually caused by something other than the experiment. These discomforts ranged from sunburn to soreness due to physical activity done prior to the experiment.

The difference in light rating was not found to have a corresponding difference in performance. This may be attributed to individual differences. As can be seen by the table, the performance averages, for the kiosk/task lighting was always less than the others. The other two had averages that were very close to each other in all phases of the analysis. This might suggest that a study done for a longer period of time would bring these differences to a significant level.

Significance may have been obtained in a couple of other ways. One way to produce significance might be to increase the size of the group that was studied. Instead of using 20 subjects per condition it may have been better to use more. Another way that may help would be the recruiting of subjects that had experience in clerical work and were familiar with a personal computer in an office environment.

Table 2. Areas of Discomfort

DIFFUSE

Eyes	Yes	9	No	11
Neck	Yes	6	No	14
Back	Yes	1	No	19
Buttocks	Yes	0	No	20
Thighs	Yes	1	No	19
Calves	Yes	0	No	20
Feet	Yes	1	No	19

LOUVERED

Eyes	Yes	8	No	12
Neck	Yes	4	No	16
Back	Yes	2	No	18
Buttocks	Yes	0	No	20
Thighs	Yes	1	No	19
Calves	Yes	0	No	20
Feet	Yes	2	No	18

KIOSK/TASK

Eyes	Yes	9	No	11
Neck	Yes	4	No	16
Back	Yes	3	No	17
Buttocks	Yes	2	No	18
Thighs	Yes	0	No	20
Calves	Yes	1	No	19
Feet	Yes	0	No	20

TOTAL

Eyes	Yes	26	No	34
Neck	Yes	14	No	46
Back	Yes	6	No	54
Buttocks	Yes	2	No	58
Thighs	Yes	2	No	58
Calves	Yes	1	No	59
Feet	Yes	3	No	57