Computer Use and Training of College Freshmen with Low Vision

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Abstract: PURPOSE: The knowledge, experiences and attitudes of computer use in college freshmen with low vision were examined by focussing on the change between two periods. Interviews were conducted first at the time of entering the college, and secondly at the 8 weeks later. METHOD: Thirty-three college freshmen with low vision were asked to reply to questionnaires regarding experience with, knowledge of, and attitudes toward computer use. The demographic and pathological characteristics of each subject were also described. RESULTS: Nearly half of the students were familiar with computers, but about twenty percent of them entered without any computer experience at all. The longer the students used computers, the more frequently they used them ($r=0.833$, $p<0.01$). Experiences with Word Processor, Presentation, Screen Reader, and Screen Magnifier application significantly increased after eight weeks. The relationship between the visual acuity and assistive technology use was found. The knowledge of and attitudes toward computer usage did not change during two periods.
Key Words: Computer Use, Low Vision, Training of College Freshmen

INTRODUCTION

In this information age, the quantity of information has dramatically increased, and the transmission speed of information has made rapid progress. Those are entirely thanks to the advancement of computers and the Internet[1,2]. On the other hand, computers have been coming into wide use not only as professional calculators, but also as common tools in daily work.

However, some persons have a psychological trait of fear in using computers. This is commonly referred to as computer anxiety. Many studies have examined the relationships of computer anxiety with such factors as prior experience with computers, confidence in ability to use, computer ownership, age, gender, personality and so on[4-6]. But, in a computer-enriched environment, student attitudes toward computers positively change when they are exposed to computers[7].

Commonly, there are two major restrictions of visual impairment. These are mobility and written language. Though some problems of mobility still remain unsolved so far, the computer users with visual disability have gained access to broader information by electronic written information. The characters converted into electronic codes can be presented on a tactual display of Braille output and on an auditory display of a synthesized voice device. Moreover, the size of letters or graphics on a visual display can be optionally changed by screen magnification systems for low

vision users.

Tsukuba College of Technology emphasizes learning in an enriched computer environment, and is trying to cope with personalized settings of computers for various eye conditions of students. But, with the spread of Windows OS, some serious matters have come to the users with visual disability, in spite of the convenient additional functions. We observe there was an individual difference in the computer using plasticity among the students after the several month intensive training course. The students who made good progress in their skills through the course might have had the experience of using computers before entering the college. Conversely, the students who had had little exposure to computers before the entrance, made slow progress regardless of their intellectual ability or eye condition. Furthermore, the female students who were older and felt difficulty in operating machines, were also poor users of computers.

Therefore, in order to develop an effective computer training course which includes the use of assistive technology, it was suggested that a good training strategy should be individualized instruction fitted to the psychological and pathological characteristics of the student[8]. This investigation was aimed at grasping the freshmen's traits of experiences, awareness, and knowledge of computer use. We conducted the first interview at the time students entered the college and the second was made 8 weeks later.

METHOD

Subjects:

The subjects who participated in this investigation were 33 college freshmen with low vision. The mean age was 23.78 years old (SD=9.11, range=18 to 67), 20 male and 13 female.

Questionnaires:

We asked the subjects questions in three main phases.

The first was "How many years have you used a computer?" This question contained the using period (years), the frequency of use (times per week), and the computer ownership. And additionally, we asked whether the subjects knew or had experience using such computer applications as Word Processor, Electronic Mail, the Internet Browser, Assisted Technology Systems, etc.

The second was a question about the knowledge of computer systems, e.g., such fundamental concepts as components, functions and peripheral devices of computers.

The awareness or attitudes toward computers was the third phase of the questions. In this case, views regarding the necessity, liking and confidence for computers, math anxiety, and technical capability were inquired about.

Regarding personal variables, we received individual data of age, sex, visual acuity, visual field and preferred point size of letters. We were given from the subjects their oral informed consent for the study concerning the contents of tasks, the range of publication and the protection of personal data.

RESULTS AND DISCUSSION

1. Demographic characteristics

We categorized the corrected visual acuity of subjects into three levels, i.e., severely impaired (under 0.04 in decimal), moderately (0.04-0.1) and slightly (above 0.1). There were 5 students who were severely impaired, 7 moderately and 21 slightly impaired.

Now, although the measurement of visual field restriction should not simply be defined by the degree of total intact visual field, we tentatively categorized the visual field into three levels; severely (under 10 degree), moderately (10-50 degree) and slightly impaired (above 50 degree). In this case, 8 subjects were at the severely impaired level, 5 at the moderate and 20 subjects at the slightly impaired level.

Moreover, the preferred point size of letters printed out by Osaka font of Macintosh was asked of every subject. As a result, there were 3 students who preferred 10-point letter size, 7 for 12-point, 10 for 14-point, 3 for 18-point, 6 for 24-point and 4 subjects who preferred 36-point letter size.

2. Pre-experience of computers

The results of freshmen experience with computers before the college entrance is shown in Table 1. As the percentage of those who had never used computers was 18.2 percent, most freshmen had some experience with computers before the entrance though there were differences in the period and frequency of computer use. Nearly half of the students were familiar with computers because 45.4 percent of the freshmen had being used computers at least a period of one year. On the other hand, there were students who had no or little experience of computers before the entrance. They were suddenly exposed to computers in an unfamiliar computerized environment and demanded to use them. This may become a serious problem to be solved in educational settings.

The second item of the table is the frequency of computer use per week. Of eight freshmen who responded that they did not use computers once a week, six were students who had never used computers before, and two were users of less than one year. Moreover, of seven students who responded that their frequency of the use was about once a week, six students had experienced computers less than one year and the rest was a less than two-year user Therefore, some relationship will be expected between the period and frequency of computer use. Now, when conveniently considering these two variables as an interval scale, we got the correlation coefficient between two variables. We found the trait that the longer the students had used computers, the more frequently they used them as shown by the high value of correlation efficiency ($r=0.833$, $p<0.01$).

Next, the results of the question of whether they had a computer which could be freely used was shown in the table. As the number of students who did not have proper computers without restriction of use was eight (24.2 percent), most of the freshmen had studied in a learning environment where proper computers existed somewhere. In order to examine whether the variable of computer ownership effects the variable of the experience of computer use, we recoded the value of computer use variable NO USE as 1, UNDER 1 YEAR as 2, UNDER 2 YEARS as 3, and OVER 2 YEARS as 4. And we also transformed the frequency of use data into four metric

values, those were NO USE as 1, ONCE PER WEEK as 2, TWICE PER WEEK as 3, and EVERY DAY as 4. ANOVA indicated statistical significant effects of the computer ownership on the richness of the computer experience ($F(3,29)=3.851$, $p<0.05$), and on the frequency of computer use ($F(3,29)=3.104$, $p<0.05$).

Table 1 Pre-Experience of Computers

Question	Number (Percent)
Experience of computers	
No use	6 (18.2)
Within one year	12 (36.4)
One to two years	6 (18.2)
More than two years	9 (27.2)
	33 (100)
Frequency of computer use	
No use	8 (24.2)
1 times per week	7 (21.2)
2 times per week	8 (24.2)
Every day	10 (30.3)
	33 (99.9)
Ownership of computer	
Without my computer	8 (24.2)
At the school or workplace	3 (9.1)
At the home	15 (45.5)
At both places	7 (21.2)
	33 (100)

3. Experience of computer application

At the upper part of Table 2, the results of the experience of applications are shown. Each mean number indicates the individual evaluation by the student coded WITHOUT KNOWLEDGE as 1 and FREQUENTLY USE as 4, etc. The means of the first investigation are the measurements at the time just after the subjects entered the college, and the second means are of the investigation after eight weeks, and t values indicate the results of the paired t test concerning the difference of the two variables. From the table, it is shown that the experiences of Word Processor, Presentation, Screen Reader, and Screen Magnifier significantly increased after eight weeks. It seems to be natural for the subjects that the use of the Word Processor increases in their learning environment where many computers are provided and students are demanded to write the e-mail and reports by using the Word Processor. In this connection, there are 11 students (33.0 percent) who did not use the Word Processor before the entrance, and 3 students who still did use it after 8 weeks.

For the application of Database and Presentation, most subjects did not know them but came to understand their existence after the entrance. Specifically, 23 students responded that they had not used Database application before, but 10 of the students changed the rate to "use sometimes" after 8 weeks. For Presentation software, of 23 students who answered they had not used it before, only 3 students changed their rates to YES responses.

Furthermore, the use of both Screen Reader and Screen Magnifier significantly increased during 8 weeks. The subjects who had not known or used Screen Reader were 27 (81.8 percent) at the first investigation, but after 8 weeks the number decreased to 15 (45.5 percent). For Screen Magnifier, the rate dramatically decreased from 22 (66.7 percent) to 8 (24.2 percent). The correlation coefficient between Screen Reader usage and visual acuity was -0.416 ($p<0.05$), and the r value between Screen Magnifier and visual acuity was -0.397 ($p<0.05$). We found that there was a relationship between the functional level of visual acuity and the use of assistive technology systems.

4. Knowledge of computers

In the middle part of Table 2, two mean values of the knowledge of 10 words about computers are shown, the first is for the first investigation and the second is for the investigation after 8 weeks. Though students are now learning the system of computers in the lecture of Basic Information Technology, they have not yet developed appropriate concepts about computers because the difference between the two periods was not statistically significant. Considering the knowledge data as a dependent variable, we processed ANOVA for such independent variables as the experience and personal condition of visual impairment, but did not obtain statistically significant effects in any cases.

Table 2 Changes with Computer Usage, Knowledge of Computers and Attitudes toward Computers in College Freshmen with Visual Impairment (n=33)

	first investigation	8 weeks later	
Investigated items	*M* (*SD*)	*M* (*SD*)	*t*
Software usage[a]			
Word processor	2.82(0.77)	3.13(0.66)	-2.33*
Email	2.79(0.99)	3.10(0.86)	-1.76
Internet browser	2.91(0.98)	3.16(0.77)	-1.79
Spreadsheet	2.15(0.76)	2.34(0.70)	-1.97
Database	1.36(0.60)	1.84(0.81)	-3.70**
Presentation	1.33(0.54)	1.47(0.67)	-2.10*
Screen reader	1.97(0.95)	2.63(1.00)	-4.40**
Screen magnifier	2.24(0.86)	3.03(0.74)	-5.20**
Knowledge of computers[b]			
Correctness points	5.73(2.11)	6.13(2.11)	-0.95
Attitudes toward using computers[c]			
An essential tool	2.89(0.36)	2.81(0.40)	0.57
Fun using computers	2.67(0.54)	2.56(0.62)	1.07
Confidence regarding computer usage	2.10(0.68)	2.31(0.70)	-1.36

Note. The first investigation was done immediately after their college entrance. A higher mean score indicates a more positive reaction.

[a]Muximum score = 4. Minimum score = 1.

[b]Muximum score = 10. Minimum score = 0.

[c]Muximum score = 3. Minimum score = 1.

The data was analysed by paired t-test procedure.

*p< .05. **p< .01.

5. Attitudes toward computer use

At the lower part of the table, the mean values for the two periods are shown. These are for the responses about the attitudes toward computer use. For the question about whether computers would become important tools for them, YES answers were 28 (84.9 percent) at the first time, but the number slightly decreased to 26 (78.8 percent) after 8 weeks. There were no students who did not recognize the importance of computer use. For the question about whether they liked to use computers, YES responses were 23 (69.7 percent), but after 8 weeks that number decreased to 20 (60.6 percent). One student answered that he had possessed a positive attitude to computer use at the college entrance, but changed his thought to a negative direction. To the question whether they were confident of using computers, 9 students (27.3 percent) answered YES at the first time, and the number increased to 14 (42.4 percent) after 8 weeks.

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