The Influence of Direct Computer Experience on Older Adults' Computer Attitudes

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Running Head: Computer Attitudes

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The rate at which personal computers have proliferated in society is more than five times faster than the rate at which automobiles and telephones were adopted after their introduction (Gantz, 1985). Computers have become an integral part of our society in a relatively short period of time. In the past two decades computers have been introduced into the workplace, the educational system, commercial enterprises, and the home.

Given the pervasiveness of computers in current society, it is becoming increasingly necessary for older adults to feel comfortable with and to have the ability to utilize this technology. Yet, older adults represent the age group least likely to use computers. Only 1% of persons aged 65 and older use a computer, as compared with 9.5% of those aged 55-64, and 17.5% of those aged 45-54 (Schwartz, 1988). One potential barrier to the elderly's use of computers are their attitudes towards computer technology.

The Relationship between Computer Attitudes and Computer Use

Many studies report significant positive relationships between use of computers and related technologies and positive attitudes toward computer technologies (Arndt, Clevenger, & Meiskey, 1985; Arndt, Feltes, & Hanak, 1983; Chen, 1986; Dambrot, Watkins-Malek, Silling, Marshall, & Garver, 1985; Kerber, 1983; Kerschner & Chelsvig Hart, 1984; Krauss & Hoyer, 1984; Miura, 1985; Zoltan & Chapanis, 1982). More positive technological attitudes have also been found to predict greater acceptance and usage of new communication technologies (Grantham & Vaske, 1985). However, since attitudes and experience have been measured concurrently in most studies, it has been

difficult to examine whether positive attitudes were antecedent to computer utilization, or whether positive attitudes were an outcome of computer experience. The results of a few intervention studies in this area are mixed. Some suggest that direct experience with technologies, such as the computer, may lead to more positive technological attitudes (Danowski & Sacks, 1980; Mathis, Smith, & Hansen, 1970; Rosenberg, Reznikoff, Stroebel, & Ericson, 1967); others report no attitude change resulting from the computer experience (Ansley & Erber, 1988; Czaja, Hammond, Blascovich, & Swede, 1986).

The present intervention study examined whether older adults' attitudes toward computers became more positive as a function of direct computer experience (i.e., a two-week computer training program). Since the study involved a multidimensional approach to attitudes, it was possible to examine the specific dimensions showing change as a function of experience. Differential change across attitude dimensions was also examined.

Method

Sample

The sample comprised 101 White older adult volunteers (27 Men, 74 Women) from rural central Pennsylvania. The mean age of the sample was 75.06 years (SD = 5.93, range = 57 - 87). The sample was well educated, averaging 13.44 years of schooling (SD = 3.14, range = 6 - 22). Mean annual total family income was $16,000. On average, the sample rated their health as good, their hearing and vision as moderately good, and their life satisfaction as somewhat happy. The majority of the sample were widowed (45%) or married (43%); while 11% were single and 1% divorced. The

sample was divided into two groups, a Training group (n=60) and a Wait-List group (n=41). For the purposes of the present paper, the Wait-List group was examined as a control group only.

Sampling. Five research sites participated in the study; three senior citizen centers and two retirement communities. Sites, rather than individuals, were assigned to Training and Wait-List conditions. This was necessary to assure that the design was not contaminated by Wait-List subjects experiencing the computer, either directly or indirectly, at the training sites. Stratified random sampling of sites was employed to assure the greatest comparability of training and wait-list groups at pretest. Sites were assigned to groups according to type of setting (i.e., seniors center, retirement community) and socioeconomic status. Each site included at least 10-12 participants, due to the costly and time-consuming nature of the training and maintenance period. Subjects received free computer lessons and access to the computer equipment as compensation for participation.

Design and Testing Procedures

The study involved a pretest-treatment-posttest, nonequivalent control group design (Campbell & Stanley, 1963). All subjects were pretested. After the pretest, the Training group underwent a two-week computer training program, followed by a posttest. The Wait-List group was posttested approximately four weeks after the pretest, and had no contact with the computer or the researcher during that time. All testing and computer training took place at the research sites in the communities where subjects resided. Pretesting was conducted in small groups of between 3-13 subjects by a tester.

A proctor was also present for groups of larger than eight people. Posttesting was conducted individually.

Measures

As part of a larger testing protocol, including personality, cognitive ability, and computer skill assessments, subjects completed a computer attitudes questionnaire and a background information questionnaire. The attitudes questionnaire was completed at both measurement occasions.

The Attitudes Toward Computers Questionnaire (ATCQ). The ATCQ is a multidimensional measure which assesses seven dimensions of attitudes toward computers: Dehumanization, People in Control, Interest, Gender Equality, Efficacy, Utility, and Comfort with the computer. All 35 items are in five-point Likert scale format, with response options ranging from strongly disagree to strongly agree. The dimensions included in the instrument were identified in prior research on computer attitudes (Richards, Johnson & Johnson, 1986; Nickell & Pinto, 1984; Krauss & Hoyer, 1984; Zoltan & Chapanis, 1982; Dambrot et al., 1985). Sample items for each of the attitude dimensions are presented in Table 1.

Insert Table 1 about here

The Background Questionnaire. The background questionnaire assessed demographic variables, such as age; gender; educational level; income; occupational status; marital status; self-rated health, eyesight, and hearing; number of doctor visits in the past year; number of hospital days in the past year; self-rated life-satisfaction; and prior experience with computers.

Computer Training Procedures

The intervention involved providing older adults with direct "hands-on" computer experience. Five computer training sessions were conducted over a two week period. During the sessions, subjects learned general computer concepts and how to create and print banners, signs, letterhead and greeting cards. Each session lasted approximately one and one-half hours. Two Apple IIe computer systems with a graphics printer and printer switch were placed at each of the first three research sites. Due to equipment limitations, one Apple IIe with a graphics printer was placed at the final two research sites. Given that the final two sites had a relatively small number of participants (approximately 13-14 at pretest), this did not pose a problem for the computer training. The computer equipment was placed on a rectangular banquet table at each site. Folding or other available chairs were used; additional cushions were used when necessary.

Training sessions were generally conducted in groups of six, with three people sharing a computer system. Participants took turns using the computer during each lesson. The order in which participants used the computer first, second, or third varied by session. The trainer talked each participant through the lesson step-by-step, while the others observed. For sites in which only one computer was used, lessons were generally conducted in groups of three, following the same format as that outlined above. It was sometimes necessary to conduct training in smaller groups or individually due to participants' schedule conflicts, or illness. Regardless of the number of people per lesson, each subject had the same amount of direct "hands-on" computer experience.

The primary instructional method was direct instruction on how to complete each days' lesson. Immediate feedback was provided for all responses. The training specifically targeted the computer efficacy and comfort dimensions. It was designed such that all subjects would feel comfortable with the computer and training program, and would experience success in operating the computer. In addition, each subject received a manual of step-by-step instructions covering the material from each of the five lessons.

The software program used in training was a menu-driven desk-top publishing program titled, Print Shop (Broderbund, 1986), which allowed users to integrate graphics and text to create greeting cards, stationery, signs, and banners. This program was selected because it had high interest value for participants, was fairly easy to operate, and provided opportunities to create and print materials that could be kept or shared with others.

Results

Score Derivation

Seven factor scores were calculated for the Attitudes Toward Computers Questionnaire (ATCQ). The factor scores were standardized to a mean of zero and a standard deviation of one. The standardization base for the scores was the pretest data for the entire sample.

Pretest Equivalence

The Training (n = 60) and Wait-List (n = 41) groups were compared on demographic characteristics, prior computer experience, cognitive abilities, and pretest computer attitudes. The two groups differed significantly on two demographic variables (i.e., marital status, income), inductive reasoning ability, and the People in Control

ATCQ attitude dimension. The Training group (58%) was more likely than the Wait-List group (27%) to be widowed (X^2 [2] = 9.40, p = .009). The Wait-List (WL) group reported a significantly higher annual family income than the Training (TR) group (t [89] = 2.64, p = .01) (WL M = 5.05, SD = 1.58; TR M = 4.15, SD = 1.63). The Wait-List group scored significantly higher than the Training group on inductive reasoning ability (t [99] = 2.82, p < .01: WL M = 53.10, SD = 10.33; TR M = 47.63, SD = 9.02), and on the attitude factor assessing the belief that people are in control of computers (t [99] = 2.02, p = .05) (WL M = .15, SD = .63; TR M = -.10, SD = .63). The groups did not differ significantly in age; sex; education; self-rated life satisfaction, health, hearing or vision; prior computer use; prior use of other technologies; verbal meaning or spatial orientation ability; or the remaining six attitude dimensions.

Sample Attrition

Eight women, from all five sites, terminated study participation prior to the first posttest. Five dropped out due to their own poor health (e.g., stroke, flu, broken shoulder); one dropped out to care for other relatives; and two others dropped out because of travel commitments. These eight women did not differ significantly from other study participants at pretest on any demographic characteristics, prior computer experience, or computer attitudes. Therefore, attrition was determined to be random, and not to influence the study results.

Training Effects

Attitude change. Two group (Wait-List, Training) x 2 occasion (pretest, second measurement occasion) repeated measures analyses of covariance (ANCOVA's) were conducted to examine the effects of computer training on computer attitudes.

ANCOVA's, using income and inductive reasoning ability as the covariates, were conducted to adjust for pretest differences between the Wait-List and Training groups. These adjustments assured that group differences found in attitude change were not attributable to pretest group differences in total family income or inductive reasoning ability. The means, standard deviations, and F-ratios corresponding to these analyses are presented in Table 2. For these analyses the Wait-List group served as a control group.

Insert Table 2 about here

As indicated in the table, significant occasion and group x occasion interactions were found for the two computer attitude dimensions targeted by the training program -- comfort and efficacy. Computer comfort and efficacy increased from pretest to posttest 1 to a significantly greater degree for the Training than the Wait-List group (see Figures 1 and 2).

Insert Figures 1 and 2 about here

Significant occasion effects were also found for the attitude dimensions of gender equality, interest, and dehumanization. For both the Wait-List and Training groups, gender equality and computer interest increased, while dehumanization decreased. Significant group effects were found for the interest and comfort dimensions, with the Training group scoring higher than the Wait-List group across occasions. No significant effects were found for the utility or control dimensions.

Magnitude of change. In order to compare the magnitude of change for the different attitude dimensions, effect sizes for the total sample were calculated. Effect sizes express the magnitude of change in standard deviation units. The comfort and efficacy dimensions showed the greatest change; .51 and .39 standard deviations, respectively. The effect sizes for the remaining dimensions showing change were .32 standard deviations for gender equality, .25 standard deviations for computer interest, and .18 standard deviations for dehumanization.

Discussion

As hypothesized, the computer training resulted in significant increases in computer efficacy and comfort attitudes for the training group. The training program was, therefore, successful in changing the targeted attitude dimensions. This finding is consistent with prior attitude change research using direct computer experience as a means of changing computer attitudes (Danowski & Sacks, 1980; Mathis, Smith & Hansen, 1970; Rosenberg, et al., 1967). The results of the present study, however, also identified differential change across the attitude dimensions. Prior studies (Danowski & Sacks, 1980; Mathis, Smith & Hansen, 1970; Rosenberg, et al., 1967) have used unidimensional measures, thus obscuring these differences.

Unexpectedly, both the Wait-List and Training groups' gender equality and interest attitudes increased, while dehumanization attitudes decreased from pretest to the second measurement occasion. That is, the Wait-List group's attitudes changed without their having had direct contact with the computer. A possible explanation for these results lie in the fact that although the Wait-List group did not use a computer during the one-month interval between the pretest and second measurement occasion,

they did have ample time and opportunity to think about, talk about, and otherwise anticipate the experience.

If the Wait-List group had been a control-only group, with no expectation of computer use, it is possible that no significant attitude change would have occurred. The heightened awareness of computers and anticipation of use for the Wait-List group likely provided additional information about computers on which the attitude change was based. This hypothesis is consistent with research by Fazio, Lenn and Effrein (1983/84), which suggests that expectations that one will be questioned about or will use an attitude object, leads to the formation of attitudes toward that object. It follows that expectation of use may similarly lead to change in attitudes toward the object.

Contrary to expectation, no significant occasion effects were found for the utility and control dimensions. A possible explanation for these findings may rest in the structure of the attitude items. The items on these scales refer to people and society in more general or abstract terms, rather than at the individual level. For example, two utility scale items were "Life is harder with computers" and "Life is faster with computers." Examples of control scale items include, "People are smarter than computers" and "Our world will never be completely run by computers." Individual computer experiences may not influence computer attitudes at this more general level. This is consistent with other research (Ansley & Erber, 1988) which failed to find attitude change following direct computer experience, when using a measure which assessed attitudes at a very broad, societal level. These results also indicate that the pretest differences between the Wait-List and Training groups on the control dimension were due to income and inductive reasoning ability differences. Persons with higher

incomes and greater inductive reasoning ability report greater feelings of control regarding computers.

The fact that interest increased for both groups was unanticipated, particularly given the fact that all subjects would be expected to have had high pretest computer interest to volunteer for the study. Change in computer interest for the Training group may be due to characteristics of the software program, and aroused interest due to computer exposure. The Print Shop program was selected because of its high interest value. Indeed, everyone in the study reported that they would recommend the program to their friends and to their family. Therefore this interest value may account for the increased computer interest; a less interesting or challenging program may have resulted in no change, or decline in interest. It is also possible that exposure to the computer in this limited context, further aroused the subjects' curiosity and interest in other computer applications. The Wait-List group's increased computer interest may have resulted from the anticipation of use or curiosity noted earlier.

Study Limitations

Limitations to the study which may influence the generalizability of the results concern the sample, and determination of when the attitude change occurred. The sample for the present study was unique in that all participants volunteered to undergo a computer training program, involving a total time commitment of between one and two months. Given the length of the time commitment, and the technological nature of the program, it is likely that the sample is representative only of others who would also volunteer for such a program. In addition, because of the small sample size for men, it was not possible to examine gender differences in training effects. Second, it is unclear

from the present data when the attitude change occurred (e.g., after Lesson 3 or 5). Prior research indicates that a single session or day's contact with the computer does not result in attitude change (Ansley & Erber, 1988; Czaja, et al., 1986). However, the precise amount of time required for attitude change to occur is unknown.

Conclusions

The present research suggests that older adults' computer attitudes are modifiable; and that direct computer experience is an effective means of change. Change differs by attitude dimension; those dimensions most closely targeted by the training program (i.e., comfort and efficacy) exhibit the greatest change.

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Table 1
Sample Items for the Seven Dimensions of the ATCQ

Comfort	
	I feel comfortable with computers.
Gender Equality	
	More women than men have the ability to become computer scientists.
People in Control	
	Computers will never replace the need for working human beings.
Dehumanization	
	Computers turn people into just another number.
Interest	
	Computers would be (are) fun to use.
Utility	
	Computers make the work done by people more difficult.
Efficacy	
	I think I am capable of learning to use a computer.

Table 2
Means, Standard Deviations, and F-ratios for Computer Attitude Repeated Measures ANCOVA's (Pretest to Posttest 1)

		Occasion						
		Pretest		Posttest 1		F[1,80 or 82]		
Attitude Dimension	Group	M	SD	M	SD	Group	Occasion	G x O
Comfort	WL	-.07	(.70)	.09	(.70)	9.23[b]	25.65[c]	7.54[b]
	TR	.08	(.64)	.62	(.74)			
	Total	.02	(.67)	.40	(.77)			
Gender Equality	WL	.02	(.68)	.11	(.68)	1.68	8.44[b]	2.59
	TR	-.01	(.68)	.31	(.71)			
	Total	.00	(.67)	.22	(.70)			
Control	WL	.16	(.63)	.19	(.48)	1.13	2.22	.94
	TR	-.09	(.65)	.07	(.49)			
	Total	.02	(.65)	.12	(.49)			
Dehuman-ization	WL	.00	(.76)	-.06	(.75)	2.62	4.17[a]	1.16
	TR	-.10	(.75)	-.29	(.67)			
	Total	-.06	(.75)	-.19	(.71)			
Interest	WL	-.03	(.63)	.10	(.55)	4.53[a]	5.58[a]	.16
	TR	.08	(.64)	.26	(.69)			
	Total	.03	(.63)	.19	(.64)			
Utility	WL	-.02	(.70)	.04	(.68)	2.01	1.36	.06
	TR	.08	(.68)	.16	(.53)			
	Total	.04	(.68)	.11	(.60)			
Efficacy	WL	.07	(.84)	.15	(.67)	2.35	14.25[c]	7.46[b]
	TR	-.02	(.73)	.45	(.76)			
	Total	.02	(.78)	.32	(.73)			

Note. WL = Wait-List (n = 36), TR = Training (n = 48). Covariates included income and inductive reasoning ability.
[a]$p<.05$. [b]$p<.01$. [c]$p<.001$.

Figure 1
Training Change in Computer Comfort Attitudes

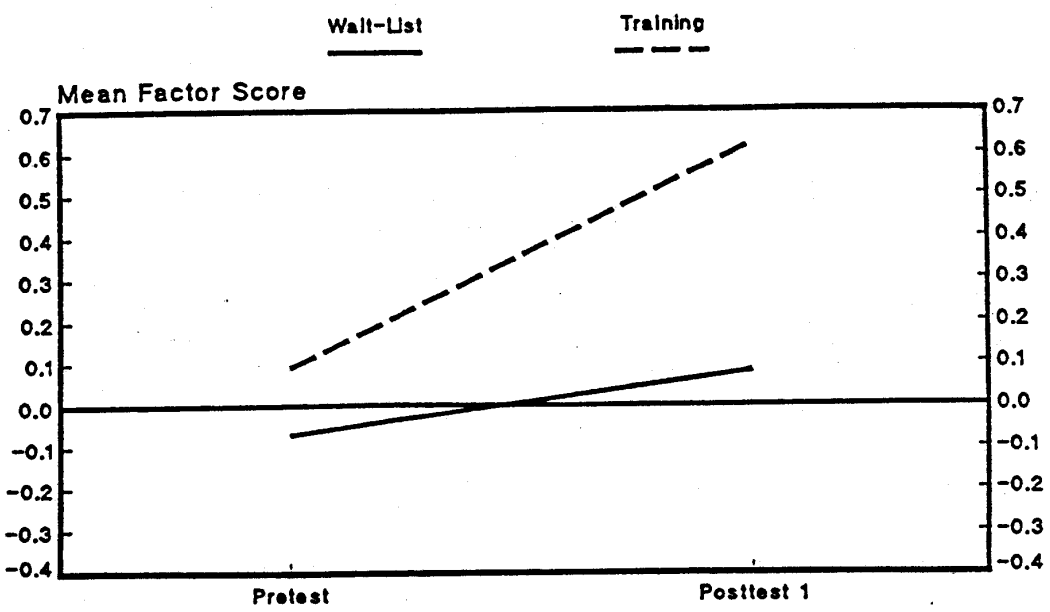

Figure 2
Training Change in Computer Efficacy Attitudes