ATTITUDINAL STUDY OF OLDER ADULT AFRICAN AMERICANS' INTERACTION WITH COMPUTERS

by

Nigel Leon Lovell-Martin

A Dissertation Submitted to the Faculty of

The College of Education

in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Florida Atlantic University

Boca Raton, Florida

April 2009

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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Valerie C. Bryan, Department of Educational Leadership, and has been approved by the members of his supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

SUPERVISORY COMMITTEE

Valerie C. Bryan, Ed.D.
Dissertation Advisor

Mary Lieberman, Ed.D.

Patricia Maslin-Ostrowski, Ed.D.

Angela Rhone, Ed.D.

Robert E. Shockley, Ph.D.
Chair, Department of Educational Leadership

Valerie J. Bristor, Ph.D.
Interim Dean, College of Education

Barry T. Rosson, Ph.D.
Dean, Graduate College

April 16, 2009
Date

ACKNOWLEDGMENTS

Mine has been a rigorous journey punctuated with challenges, many of which have led to a transformation of my meaning perspectives. To those who have facilitated my learning during this most unforgettable period, I extend my sincerest gratitude.

Perhaps the people most deserving of this gratitude are the members of my supervisory committee. My research skills were developed and honed under the direction of Dr. Patricia Maslin-Ostrowski and Dr. Mary Lieberman. They are excellent researchers and have contributed in significant ways to the completion of this project. I am grateful to Dr. Angela Rhone, a remarkable teacher who heightened my awareness regarding the African American experience. To Dr. Valerie Bryan, who has taught me much about "growing old," I owe a debt of gratitude. She has been patient, persistent and pragmatic in her role as chair and as my mentor. To these four stalwarts I express sincerest gratitude.

There are others to whom I will always be grateful: My late parents Rudolph and Elsie who were patient with my precocity and encouraged me to question conventional beliefs and assumptions; Dr. Lucy Guglielmino, who introduced me to the study of adult education; Dr. Sherry Willis, for her permission to use the Attitude Towards Computers Questionnaire (ATCQ); Ms. Chin Chin Lee, for providing the modified version of the ATCQ that was used in this project; Dr. Sara Czaja, for her advice on the research design during the proposal stage of this project; Mrs. Kristin Seow, who provided computer instruction; and to the participants who made it all possible.

To my dear wife Barbara and our beloved children, Kadeem, Khalil, and Khandi, I remain sempiternally indebted. They were supportive and patient as I studied, and I am most appreciative for those things we were able to do as a family.

Finally, to God, the Creator, Redeemer, and Sustainer without whom I could have accomplished nothing, to God be glory now and forever.

ABSTRACT

Author:	Nigel Leon Lovell-Martin
Title:	Attitudinal Study of Older Adult African Americans' Interaction with Computers
Institution:	Florida Atlantic University
Dissertation Advisor:	Dr. Valerie C. Bryan
Degree:	Doctor of Philosophy
Year:	2009

It was estimated that 35 million people age 65 or older lived in the United States in 2000. Of that number 2.8 million were Black/African American. The U.S. Census Bureau's (2000) population projections show that there will be 70 million older adults age 65 or older by 2030 and African Americans are expected to comprise over 12% of that population. In 1993 older adults had made less elective use of computers than younger adults, accounting for 24.2% of those age 55 to 64 and 4.9% of adults over age 65. By 2003 adults over age 65 recorded a 20.1% increase in computer usage becoming the fastest growing segment of computer users who are engaging in learning computer skills as a way of coping with the technological changes. Studies have found that greater experience with computers is associated with more positive attitudes; however, it has never been determined whether this is true of the older African American population since there is a paucity of research documenting their computer attitudes. This study utilized a mixed methods research design that included an experimental design and an

inductive approach with interviews. The following findings emerged: (a) attitudes differed for older African Americans who received computer training and those who did not; (b) there was no distinction in computer attitude between older adult male and older adult females in the African American population; (c) there was no interaction effect on computer attitudes as moderated by training and gender; (d) older African Americans exhibited a positive disposition towards computers which elicited positive attitudes towards the technology; (e) older African Americans had a nascent need for computer self-efficacy; and (f) older African Americans constructed new meaning regarding computers as a result of their reflection on their computer interaction experience. The findings have established that older African Americans' attitudes can be influenced by direct computer experience and the study extends prior research by identifying the process by which attitude change takes place.

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CHAPTER 1

INTRODUCTION

Population aging and the rapid diffusion of technology are perhaps the two most pervasive phenomena occurring simultaneously in the global society. This is an exciting time for new and imaginative research on the relationship between these two phenomena. It was estimated that 35 million people age 65 or older lived in the United States in 2000. Of that number 2.8 million were Black/African American (Strom, Carter, & Schmidt, 2004). The U.S. Census Bureau's (2000) population projections show that there will be 70 million older adults age 65 or older by 2030, and African Americans are expected to comprise over 12% of that population.

In 1993, 36% of all American adults had used a computer. Older adults, however, had made less elective use of computers than younger adults, accounting for 24.2% of those age 55 to 64 and 4.9% of adults over age 65, leading to speculation that older adults are less likely to use computers because of poor attitudes toward technology (Kelley, Morrell, Park, & Mayhorn, 1999). By 2003, computer usage among adults in the 50-64 age group showed a 12% increase, while older adults over the age of 65 recorded a 20.1% increase in computer usage, accounting for 25% of all adult users (Pew Internet and American Life Project, 2005).

Studies have confirmed that ordinarily older adults are less likely to consider information communication technology (ICT) of use to them (Russell & Drew, 2001). Brickfield (1984) found that older adults had more negative attitudes toward computers

and other technologies and were less likely to use them than younger adults. Consistent with that view, Purdie and Boulton-Lewis (2003) found, in the second of a two-phase study on barriers to learning as perceived by 160 older adults, that participants were confident they would address their needs related to health, safety, and transportation successfully, but not those related to technology. The investigators also concluded that since patterns of behavior are strongly entrenched in older adults it is reasonable for them not to seek new ways of doing things unless there are clearly perceived benefits.

There has always been much conjecture regarding the suitability of older adults for learning, given the physiological changes that accompany the aging process (Purdie & Boulton-Lewis, 2003). For instance, according to the Purdie and Boulton-Lewis study, the major barrier is perceived to be a decline in cognitive processes, including attention and memory. As a result of these misgivings regarding the suitability of older persons for learning, research interest in the ability of older adults to acquire computer skills has generally focused on sensory modalities, motor function, and cognitive abilities.

Declines in all sensory modalities are associated with chronological age. One such pathology is presbyopia, the diminished ability to focus on objects that are a short distance away. Others include glare sensitivity, and contrast sensitivity (Schneider & Pichora-Fuller, 2000). These pathologies tend to occur with greater frequency in older adults and seem most relevant to computer use (Morris, 1992).

The deficiencies in motor function and manual dexterity for older adults are also documented, and the effects on computer interaction relative to the use of the mouse and other input devices have been noted (Smith, Sharit, & Czaja, 1999; Walker, Philbin, & Fisk, 1997). The reduction in psychomotor speed has also been shown to have an adverse

effect on cognitive functioning due to time constraints on which operations can be effectively executed.

Hickman, Rogers, and Fisk (2007) have noted that learning demands working memory to activate relevant stored information and allocate attention to processing that information in order to link it to other information (either new information or information stored in long-term memory). Research findings have also indicated that older adults learn new skills more slowly than younger adults and do not reach the same levels of performance (Salthouse, 1994).

The age-related changes that affect cognitive abilities require that older adults be given more time to learn a task than do younger adults, and often older adults experience greater difficulties when working memory is involved (Mead, Spaulding, Sit, Meyer, & Walker, 1997). Schaie and Willis (1986) observed that the difficulty older adults face in recalling events is caused by the large amount of information in memory storage.

There has been, however, another line of research that has posited a parallel view. In Cattell's (1987) conceptualization of "fluid" and "crystallized" intelligences, the former has more of the characteristics of the innate, biologically determined Intelligence Quotient (IQ) that peaks in early adolescence, while the latter is influenced by education and perspective acquired over years of experience and remains stable over most of the adult years. The basic premise is that what is lost in fluid intelligence can be regained through training or counterbalanced by crystallized intelligence (Charness, 2006; Merriam & Caffarella, 1991). However, Schaie (1994) pointed out that fluid abilities show early decline and are more resistant to educational intervention, while crystallized abilities show a steep decrement by the late 70s.

Due to these decrements in cognition, older adults would usually require considerably more time than their younger counterparts when completing computer tasks (Czaja & Sharit, 1993; Morrell, Park, Mayhorn, & Kelley, 2000; Stronge, Walker & Rogers, 2002; Zandri & Charness, 1989), especially if the technology is weakly related to prior knowledge (Charness, 2006), and they are more likely than younger adults to make errors in completing text editing exercises (Gomez, Egan, & Bowers, 1986).

Although the preceding should provoke pessimistic attitudes about computer use, it is known that older adults can also be enthusiastic about using computers and to possess positive attitudes towards computers (Echt, Morrell & Park, 1998). When asked why they wanted to participate in a computer training program, older adult participants in a study conducted by Mayhorn, Stronge, McLaughlin, and Rogers (2004) provided responses that were deconstructed into four underlying motivations: enhancing communication, searching for information, remaining active, and learning for pleasure.

There are other researchers who have documented older adults' interests in the utilitarian functions of the computer, both as a communication and an information resource tool (Danowski & Sacks, 1980; Stronge et al., 2002; Willis, 1996). Most research has also found that there is no difference between older and younger adults in their attitudes towards computers (Czaja & Sharit, 1998; Kelley & Charness, 1995; Morrell & Echt, 1996). So, depending on which studies are cited, older adults may be said to be either negative or positive in their attitudes towards computers.

Ever since the aforementioned studies, adults over the age of 65 have become the fastest growing segment of computer users (Hilt & Lipschultz, 2004; Mayhorn et al., 2004), which suggests that older adults are cognizant of the trend toward a

technologically advanced society, are becoming aware of the benefits of computer usage, and are engaging in learning computer skills as a way of coping with the technological changes. A significant finding in an investigation of older adults' perception of successful aging was their ability to cope with changes (Duay & Bryan, 2006). One of the coping strategies identified in the study was engagement in learning as a means of adjusting successfully. These findings are consistent with the "gains" view of aging, which maintains that all individuals, regardless of age, can sustain an active lifestyle and contribute to society (Purdie & Boulton-Lewis, 2003).

As a racial group, however, African Americans represent a subculture in American society that emerged in response to their exclusion from the broader society (Quadagno, 2005). Before the passage of civil rights legislation, as an excluded group African Americans were confronted with oppression and discrimination due to racial prejudice, had less opportunity to obtain a formal education, or compete on a comparable level with their white counterparts. Their historical experiences with social and economic inequities continue to perpetuate the subculture as Coleman and Cressey (1993) observed, "Whites have grown increasingly resentful of affirmative action programs…and…the gap in income between blacks and …those of European origin has actually grown wider" (p. 185).

Cody, Dunn, Hoppin, and Wendt (1999) observed that racial minorities are among those who do not have access to computer technology. The issue of access has become the focus of many studies that investigate the racial disparities in access and the impact that those disparities are having on the potential changes that computer technology will impose on the society.

According to the most recent report on the Current Population Reports (2001) of the U.S. Census Bureau, less than 33% of African American households have computers, the lowest percentage of all racial groups. With only 37% of African American adults age 18 and older having access to computer technology, it is evident that more than half of the adult African American population is yet to be equipped for the rapid advances in computerization.

While research has consistently identified the correlation between access and cost (Kelley et al., 1999; Pearson, 2002), there seems to be little investigation into the psychosocial factors that influence attitudes of African Americans toward computers. In a study of low-income Hispanics and African Americans in Southern California, Stanley (2003) found that there is a complex relationship between ethnicity, identity, and attitudes associated with computers that significantly undermine motivation for acquiring computer skills. Observing the degree to which technology has become a part of the participants' everyday lives with the use of cellular phones and expensive programmable entertainment devices such as video recorders, the research suggests that the problem does not lie with bridging the access gap, but with the psychosocial resistances to computer adoption.

In an era that is characterized by the dissemination of information via computer-mediated communication, the decision to eschew the adoption and use of computers is not a viable option for anyone, regardless of age or ethnicity. As the incidence of non-communicable diseases continues to rise, research exploring the need for more effective methods to increase patient self-management skills point to the Internet as a medium to provide the appropriate health information (Jackson et al., 2005). This has led to the need

for research to elucidate how ethnic minorities currently use the Internet as a means of acquiring health information (Birru & Steinman, 2004).

In a study of predominantly older African American women with limited education and income, Bertera, Bertera, Morgan, Wuertz, and Attey (2007) found that their participants gained a sense of empowerment after learning computer skills that enabled them to access and use two prominent health websites. Jackson et al. (2005) in a study of African Americans with Type 2 Diabetes who use the Internet to access health information, found that among those who could not use the computer, older adults were more willing to learn compared to their younger counterparts.

Statement of the Problem

In the literature on aging, ethnicity has been identified as an important factor (Cornman & Kingston, 1996); however, the vast majority of research on older adults' use of technology does not address the issue of racial and ethnic diversity in that population. A seminal work on older adults' attitudes toward computers (Jay & Willis, 1992) utilized a sample of white participants in its investigation, and much of the work in the field has also used participants that were primarily, and in many cases exclusively, of Caucasian persuasion (Laguna & Babcock, 1997; Namazi & McClintic, 2003). There is a paucity of research documenting the computer attitudes of older adult African Americans, and the fact that older adult African Americans may have unique perceptions of themselves and the world, resulting from their historical and idiosyncratic experiences, validates the need for ethnicity as a necessary consideration in the research.

To date, the constructs that have received the most empirical attention in the literature on older adults' use of computers are experiences with, and attitudes toward,

computers. Studies of older adults' computer attitudes have found that greater experience with computers, in terms of usage, is associated with more positive attitudes (Czaja & Sharit, 1998; Danowski & Sacks, 1980; Dyck & Smither, 1994, 1996; Jay & Willis, 1992; Kelley et al., 1999). Although the evidence suggests that direct computer use can influence older adults' attitudes toward the technology, it has never been determined whether this is true of the older African American population. Also, an examination of the relationship between experience and attitude seems necessary to determine under what circumstances the interaction with computers can be found to create either positive or negative attitudes for older adult African Americans.

Purpose of the Study

Therefore, the purpose of this study was to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers.

Significance of the Study

This study extends prior research on the attitudes of older adults toward computers by documenting the computer experience and computer attitude of older adult African Americans. This is consistent with the prevailing view that information technology can empower previously underprivileged social groups and individuals, including older adults (Karavidas, Lim, & Katsikas, 2005; Xie, 2007). Also, the study documents the psychosocial factors (ethnicity and attitudes) related to the adoption and use of computer technology by older African Americans. To accomplish this task the study utilized a mixed-methods approach using interviews to explore participants' experiences in their interaction with computers and an experimental design to measure

the effect of the computer interaction experience on attitudes toward computers. Further, this study contributes to the practice of adult education where computer technology has been adopted to bridge the gap between educational disparities in race, income, and age, and to open channels of communication both in contiguous learning contexts and in distance learning.

Research Questions and Hypotheses

This study attempted to answer four research questions. The first question was based on findings of prior research conducted with a sample made up exclusively of white participants (Jay & Willis, 1992): Does attitude towards computers differ for older adult African Americans who receive computer training and those who do not? The second question was based on the finding in several studies indicating gender effects on computer attitudes, and conducted with predominantly white sample populations (Czaja et al., 2006; Karavidas et al., 2005): Is there a distinction in computer attitudes between older adult males and older adult females in the African American population? The third research question sought to determine the relationship between training and gender on computer attitudes: Is there an interaction effect on computer attitudes as moderated by training and gender? The fourth research question addressed through the application of a qualitative research methodology was: What is the computer interaction experience of older African Americans?

The following hypotheses gave focus to this investigation as it attempted to answer the first three questions:

Ho 1: There is no main effect due to training on the adjusted average scores on the computer attitude measure.

Ho 2: There is no main effect due to gender on the adjusted average scores on the computer attitude measure.

Ho 3: There is no interaction effect between training and gender on the adjusted average scores on the computer attitude measure.

Definition of Terms

For clarification of certain terms used in this study, the following operational definitions were used:

Older adult: the chronological age marker used in this study shall include participants in three subcategories, namely, *young-old* (age 65 to 74); *middle-old* (age 75 to 84); and the *oldest-old* (age 85 and older). However, participants were part of the age cohort that was: (a) educated in the legacy of the second "crusade for black education," which occurred from 1910 to the 1930s and involved the expansion of segregated schools for African American children, emphasizing elementary industrial education (Spring, 2001); and (b) educated in the aftermath of the 1954 Supreme Court decision in Brown et al. *v.* Board of Education of Topeka, KS. It was determined that this cohort included the first African Americans to be accorded a viable system of education in the United States (Billingsley, 1992).

African American: racial designation for United States citizens, by birth or naturalization, who are of African descent.

Computer use: externally observable human-computer interactions that transpire over time, and defined as objective computer interaction experience (Smith, Caputi, Crittenden, Jayasuriya, & Rawstone, 1999).

Computer experience: a psychological state reflecting the feelings and thoughts a person ascribes to some existing computing event, and defined as subjective computer interaction experience (Smith, Caputi, et al., 1999).

Computer attitude: defined in this study as any belief or opinion that includes an evaluation of some object, person, or event along a continuum from negative to positive and that predisposes a person to act in a certain way toward that object, person, or event (Ajzen, 2001), thus computer attitude is an overall feeling of favorableness or unfavorableness toward the computer and specific computer-related activities (Smith, Caputi, & Rawstorne, 2000).

Positive disposition: defined as attractiveness for the computer as an attitude object.

Self-efficacy: defined as the participants' judgment of their capabilities required to use the computer.

Limitations and Delimitations

The use of a modified version of the Attitudes Toward Computers Questionnaire ([ATCQ], Jay & Willis, 1992) as the only attitude measure may be considered a limitation in light of the use of other attitude measures, such as the Computer Attitude Scale and the Computer Attitude Survey, in the literature. However, the ATCQ is the only instrument with a specialized focus on older adults.

A second limitation of the study was the absence of testing that would have assessed the ability of participants to use the technology without instructor assistance. By design, the treatment condition provided guided action training, which required the facilitator to instruct participants on the steps and the order in which tasks were to be performed.

The older adult participants in the present study grew up and were educated in a non-computerized era and few have experiences with computers compared to their younger counterparts. To avoid confounding cohort effects, the study delimited the respondents to the cohort born between 1915 and 1943, inclusive of both years. This delimitation on the population parameters restricts generalization beyond this population however the reader is at liberty to determine the comparison with her/his context.

Chapter Summary and Organization of the Study

In Chapter 1 the problem has been stated along with the purpose statement and the research questions and hypotheses. Chapter 2 highlights the main literature used to support the significance of the study and introduces the expectancy-value model of attitude theory in which the study is situated. Chapter 3 further clarifies the methodology used to research the findings of this study, paying attention to issues of reliability and validity. Chapter 4 presents an analysis of the data and the findings of the study, while Chapter 5 discusses the relevance of the findings, states conclusions, and suggests recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

The topic of older adults and computer technology is important and necessitates the consideration of the research community given the aging of the population and the growing reliance on computer mediated communication. The rapid and complex changes in computer technology will continue to create a learning curve for older adults, affecting even the more computer literate Baby Boom generation (born between 1946 and 1964) as they enter older adulthood. This topic has stimulated much discussion and analysis in the field of educational gerontology and has generally manifested itself in the form of empirical study.

As early as the 1980s, the factor that has been receiving the greatest attention is older adults' attitudes toward computers. Concomitant with attitude is experience and the resulting assumption that the amount of computer experience influences the measure of attitude. Rarely have these two constructs been fully explored in concert with each other, reflecting on how each phenomenon together informs our understanding of older adults and computer technology. It is the intent of this study to do just that. Further, the review will identify and discuss the present state of the research, paying particular attention to the emergent themes; examine the methodological considerations that inform the current knowledgebase; and explore the need for a new methodology that captures both qualitative and quantitative insights into the phenomena. The review will conclude with consideration of the adoption of computers by older adult African Americans and a

justification for the use of this population as a sample for research to fill a gap in the current knowledge base.

The research question that has been addressed by most of the studies in the field has been whether experience with computers generally results in more positive attitudes toward the technology (e.g., Danowski & Sacks, 1980; Jay & Willis, 1992). Several broad themes have emerged from the literature as follows: (a) the effect of cognitive abilities on computer skill acquisition; (b) experience with computers as the most important factor influencing attitudes; (c) the influence of age differences on the formation of computer attitudes; (d) gender effects on attitudes towards computers; and (e) receptivity toward computers as a function of perceived usefulness.

It is important to understand how the studies were selected for this review and their overall strengths and limitations. Over 45 studies were selected, with varying foci that include the relationship between age and computer technology as mediated by cognitive abilities, computer anxiety, computer experience, and attitudes towards computers. Owing to the field being relatively new with a moderate literature base, all the important studies dating back to 1980 were selected. This purposeful sample of studies allowed for a more consistent interpretation. The strengths of these studies are (a) the consistency of several findings, (b) the dominance of peer-reviewed articles, and (c) most of them reviewed previous studies on the topic. Conversely, limitations include (a) the preponderance of quantitative studies, limiting the exploration and documentation of participants' comments and experiences, and (b) relatively little critique in their review of previous studies. Regardless of their strengths or weaknesses these studies have laid the

groundwork for the emergence of new perspectives and a more in-depth understanding about a profound movement in the study of older adults.

Emergent Themes

Cognitive Abilities and Computer Skill Acquisition

According to Czaja and Lee (2001) a number of studies have examined the ability of older adults to learn to use computer technology and overall, the results indicate that older adults are able to use computers for a variety of tasks. However, when compared to younger adults, older adults encounter more difficulty in the acquisition of these skills, require more training, and achieve lower levels on performance measures such as speed due to the slowing of cognitive processes associated with aging (Czaja & Lee; Jones & Bayen, 1998). Seemingly, it is this interest in cognitive abilities that dominate the research base on older adults and computer skills acquisition.

There are well-documented research findings that indicate aging is accompanied by decrements in cognitive abilities. There are virtually linear negative age differences from young adulthood to old age for latent abilities that include: inductive reasoning, perceptual speed, spatial ability, and verbal memory (Salthouse, 1994; Schaie, 1994). Salthouse (1996) also notes that the reduction in psychomotor speed impairs cognitive functioning, due to limited time in which, particular operations are effectively executed. However, Schaie has reported that intellectual decline could be remedied through educational interventions on targeted constructs. Concomitant with the findings of this research are those findings that report minimal or no decline in some cognitive capabilities, and that normal aging does not usually cause a simultaneous decline in all cognitive functions (Fisher, 1998; Mayhorn et al., 2004). Also, recent research on

cognition in older adulthood has sought to establish causal relationships between activity engagement and cognitive performance with mixed results (Salthouse, Berish, & Miles, 2002).

In one study, Ghisletta, Bickel, and Lövden (2006) hypothesized that engagement in activities including print and broadcast media, and cognitively complex activities, such as crossword puzzles, would alleviate decline in perceptual speed. Though the results of such studies may indicate that activities participation tends to slow cognitive decline, overall, the relationships between the two constructs are quite complex (Ghisletta et al.).

Research evidence indicates that decrements are found for all cognitive abilities by age 67 and remains modest until one reaches the 80s (Schaie, 1994). But, taken separately, decrements in perceptual (processing) speed is the only cognitive ability that shows significant decline, in most cases up to a full standard deviation (Schaie). It is this interest in cognition with the attendant rapid decline in processing speed that dominates the research base on older adults' acquisition of computer skills for the successful performance of computer-based tasks (Czaja et al., 2006).

In an early study Zandri and Charness (1989) investigated the influence of training method on the ability of older adults to use a calendar and notepad. They studied the impact on the acquisition of computer skills for younger and older adults by providing an advanced organizer. They also examined the effect of learning with a peer. The results indicated an age by training method (individual learning or learning with a peer) by organizer (with or without the organizer) interaction on performance in the final test. Older adults who trained alone, having the advanced organizer performed better. There was no performance effect for the other group of older adults.

Conversely, younger adult participants having the advanced organizer performed worse if they learned alone but it made no difference if they learned with a peer. The results suggest that providing an advanced organizer may be differentially effective for older adults depending on the learning conditions, and though they were 2.5 times slower, and needed three-times-as-much assistance, older adults can achieve nearly equal levels of performance as younger adults.

More recent studies by Mayhorn et al. (2004) and Charness (2006) suggest that decrements in perceptual speed notwithstanding, the other cognitive abilities, such as semantic memory (of world knowledge or facts) or crystallized intelligence abilities, that remain in tact or experience slight decline, continue to encounter new information that is often interpreted within the context of the pre-existing knowledge base.

In another study, Hickman et al. (2007) observed that with respect to training older adults the key may be to find the level at which working memory is engaged but not overloaded. Accordingly, they conducted an experiment using two types of training for participants learning to use a technology system: *guided action*–intending to reduce working memory demands by telling participants the steps and the order in which certain tasks were to be performed, and *guided attention*–that assisted participants in allocating their attention but required them to actively determine what to do for each step of the task. They hypothesized that training that minimized working memory demands would be best for older adults and that guided attention would be ineffective for older adults. However, they found that older adults performed better than young adults in both training conditions leading Hickman et al. to conclude that it is inappropriate to take a simplistic

view that older adults will always learn better in the least working-memory demanding condition.

Based on the findings presented under this rubric it would be logical to assume that insight into how older adults conceptualize the human-computer interface is not wholly dependent on perceptual speed but on the workings of all cognitive capabilities.

Cognition aside, questions regarding the ability of older adults to acquire computer skills have also been researched relative to declines in motor function and visual abilities. In a study designed to isolate and evaluate the effects of age-related differences in the noise-to-force ratio, perceptual feedback efficiency, strategy differences, and the ability to produce force as explanations for age-related differences in movement control, Walker et al. (1997) using two types of movement tasks and by analyzing movement performance according to stages of movement compared older and younger adults on their ability to position a cursor with an electromechanical mouse. The study showed that all four factors, when isolated, are significantly different for the two age groups. Older adults exhibited deficits when they were required to point and click on specific objects, clicking and dragging objects on the display screen, and single or double clicking objects.

Correspondingly, in a study that examined age differences in the performance of basic computer mouse control techniques, and the influence of age-related changes in psychomotor abilities on mouse control, Smith, Sharit et al. (1999) used a sample of 60 adults equally divided into three age groups (20-39 years, 40-59 years, and 60-75 years) to examine the ability of people of different ages to perform mouse tasks of varying complexity. Participants received training on each of the following four mouse tasks:

pointing, clicking, double-clicking, and dragging. Following training, participants performed two blocks of trials; within each block, the four mouse-control tasks were performed.

The study found that cursor control tasks with a mouse are more difficult for older people. Specifically, the older participants had more difficulty than the younger participants with the more complex tasks of clicking and double-clicking, as evidenced by longer movement times, more submovements, and more errors. The double-clicking task, considered the most difficult of the tasks, was the most sensitive to age effects. The data also provided evidence that age-related declines in motor control are related to age differences in mouse performance. Unable to home-in on the target, the older participants committed more slip errors for the clicking and double-clicking tasks than did the other participants.

The research base documenting age-related declines in visual abilities within the context of computer usage is scarce. What is known, however, is that pathologies occur with greater frequency in older adults (Schneider & Pichore-Fuller, 2000). In their research, Mayhorn et al. (2004) and Morris (1992) identified presbyopia–the diminished ability to focus on objects that are a short distance away–and glare sensitivity as being most notable in older adults' inability to operate the computer.

The significance of motor functions and visual abilities to the successful performance of computer tasks notwithstanding, it is cognition that has garnered the most attention in showing that cognitive abilities such as memory and speed processing are significant to the successful performance of computer tasks (Charness, Kelley, Bosman, & Mottram, 2001; Czaja, Sharit, Ownby, Roth, & Nair, 2001).

Computer Experience and Computer Attitude

Relatively few studies have examined cognition as a predictor in the adoption of computers (Czaja et al., 2006). However, research has shown that attitude towards computers is a significant predictor of adoption and use (Kelley et al., 1999). Early research by Danowski and Sacks (1980) examined effects of participation with computer-mediated communication on attitudes towards computers among a sample of older adults and found that positive experiences with computers resulted in more positive attitudes. Since that time older adults' attitudes toward computers have received the greatest empirical attention (Jay & Willis, 1992) and people with more positive attitudes were found to be more likely to use computers and related technologies (Czaja & Sharit, 1998; Danowski & Sacks; Dyck & Smither, 1994, 1996; Jay & Willis; Kelley et al., 1999; Smith, Caputi et al., 1999).

In attitude research, an attitude is generally defined as any belief or opinion that includes an evaluation of some object, person, or event along a continuum from negative to positive and that predisposes a person to act in a certain way toward that object, person, or event (Ajzen, 2001), such that a predisposition tends to guide behavior (Regan & Fazio, 1977). Attitude theorists concur that attitudes are acquired and changed through experience (Fishbein & Ajzen, 1975) such that persons experiencing a negative reaction to a computer will have those feelings reinforced with each exposure to the computer, resulting in a negative attitude (Rosen & Weil, 1995), and the opposite being the case for persons with a more positive experience. Thus, consistent with attitude theory, Smith et al. (2000) defined computer attitude as "a person's general evaluation, or overall feeling of favorableness or un-favorableness toward computer technologies (i.e., attitudes

towards objects), and specific computer-related activities (attitude toward behaviors)" (p. 69).

The relationship between the constructs of computer experience and attitudes towards computers has been the focus of research and constitutes the crux of the present study. Garland & Noyes (2004) identified two core issues driving these inquiries. First, there is the need to understand how attitudes toward computers may influence computer experience and how computer experience may influence computer attitudes. Secondly, there is the lack of consensus on how attitudes and experience are best measured. Further, they have noted the difficulty in reaching an agreement on a definition of computer experience, observing that current research often define computer experience in terms of amount of computer use measured in time. This leads to the difficulty whereby computer use and computer experience are used interchangeably.

Smith, Caputi et al. (1999) conceptualized computer experience as bi-dimensional consisting of objective and subjective constituents as a way of avoiding the arbitrary interchange of the terms computer use and computer experience. They differentiated the two constituents by referring to computer use as objective computer experience (OCE) and computer experience as subjective computer experience (SCE). OCE was defined as the "totality of externally observable, direct and/or indirect human-computer interactions which transpire across time" (p. 228). On the other hand they defined SCE "as a private psychological state reflecting the feelings and thoughts a person ascribes to some existing computing event" (p. 228).

In a study designed to define and empirically differentiate the concepts of computer attitude, subjective computer experience (SCE), and objective computer

experience (OCE) Smith et al. (2000) found that their preliminary evidence lent support for the bi-dimensional conceptualization of the computer experience construct, in line with Smith, Caputi et al. (1999), noting that OCE was empirically distinguished from the factors that appeared to tap dimensions reflecting the user's psychological reactions to computers. They recommended that OCE and SCE should be explored independently in future investigations.

Much of the research on older adults' attitudes towards computers was done prior to Smith et al. (2000) bi-dimensional conceptualization of computer experience thus the construct of computer experience in early studies could be appropriately defined as externally observable human-computer interactions that transpired over time, hence objective computer experience.

Age Differences on Computer Attitudes

An assumption in the knowledge base is that older adults are uncomfortable with new forms of technology and are less confident about using computers than are younger people (Dyck & Smither, 1994). It has also been documented that older adults had more negative attitudes toward computers and other technologies, and were less likely to use them than younger adults (Brickfield, 1984). Several of the studies used in this review including, Ansley & Erber, 1988; Baack, Brown & Brown, 1991; Czaja et al., 2006; Czaja & Sharit, 1998; Dyck & Smither, 1994, 1996; Laguna & Babcock, 1997; Marquié, Thon, & Baracat, 1994, document the computer attitudes of older and young adults. It might be appropriate to state at this point that a comparison between young adults and older adults is not within the scope of this study; however, it was important to draw upon

these resources for insight into their findings relative to age cohorts in the older adult population.

The influence of age differences on attitude formation is the theme that seems to yield the most disparate results. An early comparison study by Ansley and Erber (1988) investigated several aspects of the relationship between older adults and computer technology, and assessed the effect of an actual computer interaction on older adults' attitudes toward computers. Using 60 older adults (mean age 70.7 years) and 22 undergraduate students (mean age 20.90 years), the study generalized that both groups were similar in terms of their attitudes towards the potential use of computers. Older adults were more positively disposed than the younger participants in areas of values and education, but more negatively disposed in the area of politics. Overall, however, the treatment intervention had no significant effect on the older adults' computer attitudes, which remained consistent with pretreatment levels, so the study concluded that negative attitudes toward computers are not descriptive of older adults.

Dyck and Smither (1994) reported similar findings in an investigation of age differences in computer anxiety. They hypothesized that the acquisition of computer skills was affected by computer anxiety, and that computer anxiety could hinder an older adult's ability to use a computer effectively and minimize any willingness to spend time in computer related activities. Their findings, however, indicated that older adults were less computer anxious, as measured by the scales used in the investigation, had more positive attitudes toward computers, and had more liking for computers than younger adults despite having less computer experience (measured as objective computer experience). They generalized that higher levels of computer experience were associated

with lower levels of computer anxiety, and a more positive attitude towards computers. This finding is important in establishing the generalizability of the relationship between computer attitudes and computer experience to older adults.

The literature that says otherwise emerged in the early 1990s as well, with the findings reported by Marquié et al. (1994). They surveyed office workers ranging in age from 18 to 70 years about their attitude toward computers, computer use outside of the workplace, and the amount of computer training they had received. Their findings revealed that experience with computers was the most important factor influencing attitudes; nonusers had more negative attitudes and anxiety toward computers than computer users. The study also found that age influenced attitudes as older workers had more negative attitudes and less knowledge about the utility and operation of computers. Since Marquié et al. presented findings that were inconsistent with Ansley and Erber (1988), it seemed necessary to identify research that investigated age differences in computer anxiety, and that contrasted Dyck and Smither's (1994) reported findings in order to present a balanced argument. Laguna & Babcock (1997) seemed to do just that.

Investigating the relationship among age, computer anxiety, and performance on a computer task, Laguna and Babcock (1997) found that compared with younger participants, older participants reported higher levels of computer anxiety as measured by decision time on the computer test used in the investigation. Acknowledging an overlap between the constructs of attitude and anxiety, with the former being a component of the latter, high levels of anxiety would correlate with a negative attitude towards computer tasks.

Important to these disparate results is a significant finding by Baack et al. (1991). Their comparisons of older adults and young adult students revealed that older adults had a less favorable attitude towards the use of computers, consistent with their hypothesis and reflecting the older adults' lower level of exposure and familiarity with computers. However, the investigation revealed a phenomenon which they termed "vicarious experiences with computers" that seemed to influence positive self-reports by older adults regarding their attitude towards computers. In administering the attitude scale used in the investigation, they found that the more positive responses for older adults occurred on items reflecting beliefs, while more strongly negative responses related to actual use of computers.

Obviously, the study revealed a distinction between objective and subjective computer experiences as mentioned earlier in the present study (Smith, Caputi et al., 1999). For example, older adults responded strongly positive on two belief items: (a) I like to keep up with technological advances, and (b) I think that computers and other technological advances have helped to improve our lives. Conversely, responses were strongly negative to the items: (a) I like to play video games; (b) I prefer to use an automatic teller for most of my banking; and (c) I would prefer to order items in a store through a computer than wait for a store clerk.

In a related study on the discrepancy between self-efficacy beliefs and actual performance Marquié, Jourdan-Boddaert and Huet (2002) examined the reliability of the age effect on overconfidence in feeling-of-knowing (FOK) and confidence level (CL) judgments in the computer domain as compared with the general domain. Theorizing that under- or over-estimating one's abilities may influence learning performance, they found

that older participants were more lacking in confidence in their prospective judgments (FOK) than younger participants, but only in the computer domain. This finding confirmed their hypothesis that, for a given level of recognition performance, older people would rate their FOK and CL lower than young people in the computer but not in the general domain, thus indicating less confidence in their own computer knowledge.

Czaja et al. (2006) explored attitudes toward computers as a function of age and found that the older adults (60–91 years) indicated more computer anxiety and lower computer self-efficacy, both of them being attitudinal variables, than did younger and middle-aged adults. Older adults also reported less interest in computers than did the younger and middle-aged adults. Citing an earlier study by Krauss, Kenyon, Charette, Familant, and Hoyer (1983), Ansley and Erber (1988) reported a correlation between age and attitude noting that in a sample of pre-retirement adults the younger participants exhibited more positive attitudes toward computers than older participants.

Echt et al. (1998) conducted a markedly significant study in this regard. One of their hypotheses was that the old-old adults (75-89 years), even with careful design, would exhibit greater difficulty in learning how to perform computer tasks compared with the young-old adults (60-74 years) because of greater declines in cognitive ability in the older age group. Their findings indicate that the young-old adults consistently outperformed the old-old adults on all dependent measures. In addition, they concluded that the old-old could engage in computer use through training that involved specific types of computer training materials. Even though they claimed their research to be the first documentation of age related differences in computer task performance between cohorts within the older adult population, it is not.

In actuality it can be argued that Czaja, Guerrier, Nair, and Landauer (1993) were earlier in assessing the willingness and ability of older people to use a personal computer system specifically configured as an experimental prototype communication and information tool. They found that participants 65 to74 years of age used the system more often than those 55 to 64 years old, and those 75 and older, with the greater statistical difference between those 65 to 74 and those 75 and older.

As Ansley and Erber (1988) observed, older adults are not homogeneous in their attitudes towards computers. Minimizing such attitudinal factors as computer anxiety, low computer self-efficacy, and low computer-comfort would supposedly result in older adults having more positive attitudes toward computers. Results from previous studies suggest that older adults' computer attitudes are modifiable, and increased computer usage results in more positive attitudes (Czaja & Sharit, 1998; Jay & Willis, 1992; Segrist, 2004). It has also been found that direct customized computer training is a catalyst for attitude change in older adults (Segrist).

Gender Effects on Computer Attitudes

The trend seems to indicate that younger generations, possessing less computer anxiety and being more computer savvy, are better able than older adults at adapting to new and constantly changing technology (Karavidas et al., 2005). There seems to be little doubt, however, that a gender gap does exist in the adoption and use of computer technology even within the younger generation (Czaja et al., 2006).

In the early stages of research in the field Kerschner and Chelsvig Hart (1984) and Krauss and Hoyer (1985), among others, examined the relationship between gender and computer attitudes with the general hypothesis that males would be less computer

anxious than females. Results from most of these studies are inconclusive but Kerschner and Chelsvig Hart and Krauss and Hoyer reported that men had more favorable attitudes than women toward computers. Citing previous studies, Karavidas et al. (2005) noted that although both genders in the older adult population displayed interest for computers, it was the male participants who were more likely to use computer devices, and that complex tasks seem to generate more gender differences than simple computer tasks.

Unable to identify the gender differences reported in prior research, Jay and Willis (1992) documented the need for gender balance in samples to permit meaningful comparisons in future studies. In an investigation of the relationship of computer anxiety to computer experience, gender, and level of education, Dyck and Smither (1994) found a marginal interaction between gender and age, with young females indicating less computer liking than young males, while there appeared to be no difference in computer liking between older adult males and females. This prompted a recommendation for further investigation.

Two years later, the Dyck and Smither (1996) study reported significantly different findings even though they used the identical attitude scale administered in the prior study. An examination of the relationship between gender and computer attitudes revealed that female older adults displayed more negative attitudes toward computers than male older adults. Results from computer liking, computer anxiety, and computer confidence scales revealed that females had less positive attitudes than males. In an effort to resolve the discrepancy between the findings of the two studies, Dyck and Smither noted that the more recent research participants volunteered to participate in a word-

processing course, whereas the previous participants had not volunteered to participate in any type of computer treatment intervention.

A different kind of finding emerged with Czaja and Sharit's (1998) examination of age differences in attitudes toward computers as a function of experience with computers and computer task characteristics. The results indicated that direct experience with computers resulted in more positive attitudes for all participants regardless of age or gender across most attitude dimensions. The data indicated relatively few gender differences in attitudes. Women experienced a greater increase in comfort with computers following task experience than did men; however, they found computers to be dehumanizing following task experience. These results were significant since they refuted the suggestion that women are less receptive and have more negative attitudes towards computers than men. Also, there were no age-group-by-gender interaction effects, indicating that older women are as receptive to computers as are younger women.

Paradoxically, recent research involving Czaja and Sharit on gender effects (Czaja et al., 2006) indicates the opposite of what Czaja and Sharit (1998) found. Consistent with more recent findings that women's computer experiences are significantly lower than men's, that women experience significantly more computer anxiety, and had less knowledge of computers than men (Karavidas et al., 2005), Czaja et al. have found that overall, women reported higher computer anxiety, lower computer self-efficacy, lower general computer attitudes, and less interest in computers than men. On a breadth-of-computer-use variable involving experience with input devices (e.g., keyboard, mouse), proficiency with basic operations (e.g., insert a disk, save a file), and proficiency with computer applications (e.g., computer graphics, e-mail, spreadsheets) overall women

reported less experience than did men. There were also age-group-by-gender interaction effects with younger women indicating more experiences than older women.

Perceived Usefulness and Computer Receptivity

As evidenced in aforementioned portions of this study, attitudes and cognitive ability have subsumed most of the research regarding older adults and computer technology. However, in a more recent study Czaja et al. (2006) found that there was a strong, independent effect of age on outcome measures not accounted for by attitudes and cognitive ability. They identified this factor as the perceived need for technology. This finding is consistent with earlier findings in the research base. Although Brickfield (1984) is often cited by research that supports the view that older adults hold negative attitudes toward computers, that study also found that older adults are receptive to the use of technology, such as computers, if they perceive it as useful and can assist them in the performance of tasks. Other studies that have arrived at similar conclusions include those mentioned in the following paragraphs.

In a study conducted by Czaja and Sharit (1998), the researchers examined whether attitudes towards computers varied as a function of age, gender, and computer task characteristics. They found a significant main effect for Task Experience and a significant Task x Task Experience interaction for ratings on the utility dimension of the ATCQ. They concluded that perceptions of the usefulness of computers increased as participants performed computer tasks (Task Experience) and that in general, older people perceived computers as being more useful than younger participants.

Danowski and Sacks (1980) found that participants in their sample were more interested in exchanging computer messages than playing computer games, and had a

preference for games that were interactive and that simulated interpersonal conversations. Based upon the participants' self-report of the functions of the computers, the researchers concluded that the computer system might enhance the self-esteem of older adults, reduce their feelings of loneliness, increase their motivation to use computer communication systems, and increase favorableness in attitudes about the extent to which computers may help them. In the study conducted by Mayhorn et al. (2004) older adult participants identified enhancing communication, searching for information, remaining active, and learning for pleasure as the underlying motivation for their decision to participate in a computer-training program.

In an ethnographic study that offered insight into why older adults are enthusiastic about online information, Hilt and Lipschultz (2004) identified age as a variable that influences computer use, and validated the difficulties in getting older adults to adopt new technologies. However, they found that all the participants in their study used e-mail, and it was considered the most important Internet function to them since many of them participated in online communities of friends, family, and interest groups. This study underscored the fact that older adults do not readily accept new technologies unless there are perceived benefits. Others have also documented older adults' interests in the utilitarian functions of the computer, both as a communication and an information resource tool (Stronge et al., 2002; Willis, 1996).

In what is perhaps one of the most comprehensive studies on perceived usefulness of computers in predicting receptivity, Czaja et al. (1993) examined the feasibility of older adults (aged 50-95) using an electronic text message system to perform routine communication tasks. Six months into the study, participants' perceptions of the

computer system's usefulness to them indicated that the majority (65%) was satisfied with e-mail as a means of communication. Results of the study indicated that throughout the experiment participants consistently expressed an interest in having certain features added to the system, including: word processing, software to access physicians/emergency services, and software for continuing education. Undoubtedly, the two features that participants showed the greatest favorable percentage increases were use of the computer *to meet new people* (18% in May 1989 to 76% in February 1990) and to *communicate with others* (25% in May 1989 to 85% in February 1990).

The findings in the research that examined the perceived usefulness of computers in predicting receptivity underscored the importance of understanding that experience with technology and its personal usefulness reinforces positive attitudes about it (White & Weatherall, 2000). However, barriers such as physical and cognitive problems; individual dynamics; hardware and software problems could hinder receptivity (Namazi & McClintic, 2003). This requires that computer systems be designed to accommodate age changes in cognitive and perceptual abilities (Czaja et al., 1993) as older adults need assistance in undertaking the utilitarian functions of computers (Saunders, 2004).

Methodological Considerations

Across the existing research studies, theoretical and operational definitions of computer attitude and computer experience are largely invariable (Smith et al., 2000), which might be due in part to the knowledgebase being a relatively recent innovation. The absence of contradicting definitions seemed to have created an environment that fostered an early alliance with the tradition of psychometrics in developing instruments that enabled empirical measurement of the attendant variables. Much of the research in

the field has utilized an instrument that measured attitude and in some cases, anxiety as an attitudinal variable. As a result the more appropriate research methodology adopted was quantitative which allowed for a statistical model in analyses. Overall, this field of research has been dominated by quantitative research methodology (White & Weatherall, 2000).

But even with the assumption that independent studies concurred with theoretical and operational definitions there have been mixed results in the assessment of attitudes. Jay and Willis (1992) suggested that the disparate findings regarding experience with computers and attitude changes might be due to the nature of the experiences and the attitude measures used in the studies. However, this study has found that the results drawn from such studies may also vary as a function of the chosen research design (Ansley & Erber, 1988; Czaja, Hammond, Blascovich, & Swede, 1989; Danowski & Sacks, 1980; Jay & Willis, 1992; Kelley et al., 1999). Although these designs may appear similar to each other, they each have different assumptions and features that are not always explicitly outlined, but do affect the interpretation of results.

Both descriptive and intervention designs have been used in this area of research. The descriptive research studies sought answers to questions through the analysis of variable relationships. This causal-comparative research is utilized in several of the reviewed studies, including Baack et al. (1991); Czaja et al. (2006); Dyck & Smither (1994); Marquié et al. (1994); and Selwyn, Gorard, Furlong, & Madden, (2003). The difficulty with this design according to Segrist (2004) is that it is difficult to determine whether positive attitudes are an outcome of use, since the information gained about

computers is gleaned through either direct or non-direct exposure, and the nature of the exposure is important in forming the basis for attitude formation and change.

The intervention studies in this knowledge base are primarily of five types, namely: One-group pretest-posttest design, Time-series design, Multiple-groups Equivalent Materials pretest-posttest design, pretest-posttest Non-Equivalent groups design, and the pretest-posttest Equivalent groups design. One-way Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), the *t* Test, and the Factorial analysis of variance have all been used in analyses. Generally, the selection of a particular research design rendered a study either weak or effective in this review of the literature. Perhaps the least adequate design in the knowledgebase is the one-group pretest-posttest design, which was used by Danowski and Sacks (1980) and Segrist (2004).

Recognizing the paucity of prior quantitative data in this field of research, Danowski and Sacks (1980) in what they termed "a cautious initial research approach" applied the one group pretest-posttest design in their research. Without the comparison of a control group external validity is poor, and questions as to whether the participants who continued in the experiment after the pretest already had favorable attitudes toward computers cast doubts on the findings.

Using the same design Segrist (2004) detected some posttest movement in a positive direction for the mean scores on six attitude dimensions of the ATCQ, with a significant change only on the comfort dimension. However, the absence of a comparison score with a control group that was not exposed to the treatment condition renders the conclusions questionable and external validity is poor. It is possible that the Segrist (2004) study, which differed from the findings of both Jay & Willis (1992) and Kelley et

al. (1999) in their conclusion regarding computer attitude dimensions of older adults, may have varied as a function of Segrist's chosen research design.

One of the stronger research designs is the pretest-posttest Non-Equivalent groups design, which was utilized by three of the studies in the vanguard of the field, namely, Czaja and Sharit (1998); Jay and Willis (1992); and Kelley et al. (1999). Using experimental and control groups, the difference between the mean of the pretests and posttests of both groups were tested for statistical significance and the conclusions of each study were based on significant differences that were attributed to the treatment variable introduced. Though random assignment to experimental and control treatments is not applied, this quasi-experimental design is considered the only feasible one of its kind and the comparison of its groups, though not equivalent, is justifiable (Best & Kahn, 1998).

Arguably the strongest but least used design in this knowledgebase is the pretest-posttest equivalent-groups design used by Charness et al. (2001) and Czaja, et al. (1989). Experimental and control groups in both studies were equated by random assignment and the difference in gain scores of the three groups (both within and between groups) in pretest and posttest conditions were subject to a test of statistical significance. In the case of the Czaja et al. study, the overall results indicated that irrespective of training there were age-group differences in learning to perform text-editing tasks, with younger learners achieving better results than older adults.

The focus of the Charness, et al. (2001) study was on the transfer of knowledge by experienced, young, middle-aged, and older adults as they shift from a keystroke-based command environment to a graphical user interface (GUI) that stressed command

execution through menus. Results showed that novice older adults experienced more difficulty than younger adults when learning to use a computer application, even with a self-paced learning schedule. A noteworthy finding was that the interaction between software experience and age indicated that older adults with high levels of software experience showed less of a performance deficit than those with low levels of software experience. This provided evidence to conclude that age and experience can trade off with roughly equal weight. The strength of these studies is in the optimum validity of their findings resulting from the design utilized.

Considering that the prevalence of quantitative methodologies used in this area of research seem to approach the issue of older adults and technology mainly from the viewpoint of the outside researcher looking in (White & Weatherall, 2000), perhaps there is also a need for research approaches that explore the descriptive aspects of older adults' interaction with computer technology, such as participants' remarks, explanations, and an understanding of how they make meaning of their experience with technology. Thus far, there is a paucity of research that utilized the inductive approach. In this review, the work of Hilt and Lipschultz (2004); Namazi and McClintic (2003); Saunders (2004); Selwyn (2004); Selwyn et al. (2003); and White and Weatherall (2000) using ethnography, case study or grounded theory, are the only studies that meet that threshold.

Summary of Literature Themes

More than 45 studies were reviewed in this section and the majority focused on the relationship between age and computer technology as mediated either by cognitive abilities, computer anxiety, computer experience, or computer attitudes. The research indicates that older adults' use of technology is important and necessitates serious

consideration, given the aging of the population and the growing reliance on computer technology.

Concomitant with growing research on the effect of cognitive abilities on computer skills acquisition is a literature base that documents the influence of experience, age differences, perceived usefulness, and gender, on attitudes toward computers. Five primary conclusions have been reached in this research base:

1. That the decrement in sensory modalities, motor function, and cognitive abilities–particularly perceptual speed–with increased age is a ubiquitous phenomenon that affects older adults' acquisition of computer skills for the successful performance of computer tasks. However, older adults are capable of acquiring computer skills using appropriately designed training materials.

2. Younger adults exhibit more positive attitudes toward computers than older adults.

3. Older adults' computer attitudes are modifiable and direct computer experience is an effective means of change.

4. Older adult females exhibit less positive attitudes toward computers than their male counterparts.

5. Interest in computers due to perceived usefulness predicts adoption and use, and older adults with more positive attitudes were more likely to use computers.

While the literature in this knowledgebase appears to treat cognition in computer skills development as mutually exclusive of computer attitude, the body of *bridge* literature in this review connects the bases, showing that acquisition of computer skills can lead to positive attitudes toward computers. Judging from the recent contributions to

the knowledgebase, there is a growing interest in the area of research, which is a major strength in the field.

Correspondingly, there is a weakness that is couched within the literature, which this review has identified as being related to the research designs. Apart from descriptive studies, more specifically assessment studies of which there is a large corpus, true experimental designs have been underutilized in this area of research, raising questions with regard to experimental validity of the current studies. There is also a noticeable absence of an adequate representation of qualitative designs in the research base.

Literature Inclusions and Exclusions

Gender Studies and Computers

Recently, Czaja et al. (2006) found that overall, women reported higher computer anxiety, lower computer self-efficacy, lower general computer attitudes, and less interest in computers than men. This was consistent with another current finding that women's computer experiences are significantly lower than men's, that women experience significantly more computer anxiety, and had less knowledge of computers than men (Karavidas et al., 2005). These studies were significant because they were intentional in ascertaining gender parity, which was absent from several earlier studies that sampled females exclusively or predominantly, and with the absence or under-representation of males were unable to make meaningful comparisons. However, these findings were the results of assessment studies. Whether similar findings would be uncovered from an experimental study was yet to be determined.

These more recent studies may have been influenced by prior studies in the field that had recommended the need for research that examined gender differences (Jay &

Willis, 1992; Segrist, 2004) in response to such studies by Kerschner and Chelsvig Hart (1984) and Krauss and Hoyer (1985) that had concluded men had more favorable attitudes than women, toward computers.

Race Studies and Computers

Without diminishing the importance for continuing research using gender as a variable, it seemed necessary that attention be given to another significant attribute variable that was missing from the research base, namely, race. Many of the studies in the field, including several of those cited here, have used samples that were exclusively or predominantly of white participants but have failed to recommend research that examines race/ethnicity, which begged the question: *Shouldn't inquiry into the attitude of older adults consider race and ethnicity as variables?* Few studies have used and identified people of African descent as part of their data set (Czaja et al., 2006; Czaja et al., 2001), but there was yet to be a study on older adults' attitudes toward technology using a sample that was composed exclusively of people of African descent.

Historical Perspective for Research on Race and Computers

In the 100 years between 1890 and 1990 there were far reaching changes that impacted African American families. Nearly 90% of families moved to urban centers, after emigrating from the rural faming communities. American society had made the transition from industrialism to post-industrialism, reshaping families to conform to the demands of the new society. African American men lost their jobs in what was once a stable blue-collar workforce, forcing African American women out of the home and into the service sector. These changes were complicated by racial discrimination and economic marginality (Billingsley, 1992). However, the enactment of laws by federal,

state and municipal governments from the 1940s through the 1970s created significant changes in the occupational status of African Americans, as a greater number of African Americans moved into technical, sales and administrative support positions. The majority of African Americans, though, have remained in declining non-professional and non-managerial service occupations (Pinkney, 2000), where they find themselves competing with other minorities and newly arrived immigrants (Potts, 1996).

The post-industrial era is one of processing, in which communication mediated by computers is strategic for the exchange of information and knowledge. Currently, African Americans are under-represented in the information and communication technology (ICT) occupations that are the fastest growing to date (Billingsley, 1992). More than 35 years ago, Toffler (1971) predicted the emergence of a dichotomy of the "information-rich"/"information poor" in the United States. It is apparent that due to the lack of societal opportunities, including education, African Americans constitute a large segment of the "information-poor" category, faced with the risk of failure in the Information Age (Carver, 1999).

Toffler (1990) described the current era as the Third Wave of societal development in which information is increasingly viewed as a commodity, and one that is directly linked to economic and social mobility. In this era a technological infrastructure is being built to foster greater school-to-work transitions but the issues of inequity existing in America's public school systems has placed African Americans at a disadvantage (Carver, 1999).

In the case of large urban schools, which a large majority of African American students attend, there are fewer computers available per student and the types of

computers to which these students have access are much older and less powerful machines than what is available to white suburban students, creating a technological disparity between African American and white American students (Carver, 1999).

The situation confronting African Americans in the Third Wave has to be understood within the wider context of the educational history of America's black population. For approximately 300 years, during which time African Americans were enslaved, it was illegal or unacceptable to educate people of African descent in most states in the Union (Johnson-Bailey, 2006). The education of blacks in colonial America did not come about as an effort of education *per se* but rather as an effort aimed at Christianization. In his documentation of public education, Johnson (1978) reported that Christian missionaries considered it necessary to instruct slaves in the English language for the purpose of helping the slaves better understand the principles of Christian religion. Most notable for this engagement were the Quakers, Roman Catholics, and the Presbyterians. In 1740 Hugh Bryan, a Presbyterian, opened a school for blacks in Charleston, South Carolina, and by 1755 other schools had been opened in Virginia by Presbyterians interested in educating slaves for religious leadership in the slave population.

In the Reconstruction period that followed the 1861 to 1865 Civil War, Johnson (1978) noted that blacks were guaranteed the same basic education as whites, but this issue was constantly challenged in the *new* South. Thus, segregation became the most visible issue in African American education. Poor facilities, lack of funds, and poorly trained teachers were notable characteristics in the education of African Americans. The precedent setting case of Roberts versus The City of Boston in 1949 established the

beginning of *separate but equal* laws in the United States of America. The case tested the legality of maintaining the half-century-year-old separate system for African American children.

At the time of the Brown versus The Board of Education of Topeka, KS, decision of the Supreme Court in 1954, 68% of all African Americans lived in states that maintained segregated schools that were inferior to white schools in expenditure per student, training of teachers, number of books in school libraries, and length of school year (Pinkney, 2000). Since that 1954 landmark decision and with the enforcement of Title VI of the Civil Rights Act of 1964, which protects individuals from discrimination based on race, color or national origin in programs or activities receiving federal financial assistance, the median number of years of school completed indicate that the quantitative differences in education between black and white Americans have narrowed. In 1940 in the nation as a whole only 7% of black adults age 25 and older were high school graduates; however, by 1975 this number had increased to 43%, almost on par with white adults (Billingsley, 1992). These numbers, however, indicated little about the differences in the quality of education received by blacks and whites.

Pinkney (2000) has observed that current data show a gradual decrease in segregated schools in the largest cities but overall the integration of black students has changed little. Also, that the general pattern of relations between the races is one of almost total isolation of one community from the other as rigid residential patterns serve as a deterrent to structural assimilation of African Americans, residing in predominantly poor urban cities, into the life of the larger society. As a result, the extent to which African Americans have assimilated the cultural patterns of American society varies as a

function of class rather than race. The middle and upper classes of African Americans have been largely acculturated, choosing to abandon the cities in order to offer their children better educational opportunities that are available in suburban schools (Peterson, 1996). Those African Americans in the lower class have come to represent what Quadagno (2005) described as a subculture in American society that emerged in response to their exclusion from the broader society. They are the recipients of a below-standard education due to a lack of resources and funding in urban cities (Peterson).

In general the African American community is relatively young. In the 50 years leading up to 2000, the median age of the African American population increased from 26.1 years to 29 years primarily due to the average length of life and a gradual decrease in the number of children in the population. There are relatively more young people and fewer older people (65-74 years) among African Americans than there are among whites. In 2000 an estimated 8% of whites were in the 65-74 age category compared to African Americans at 5% (Pinkney, 2000).

Older adult African Americans were born in the early 20th century at the height of anti-black thought and behavior, and have experienced years of discrimination, including the inequities in education referred to in the aforementioned paragraphs (Strom et al., 2004). Many of them play an essential role in the functioning of the extended family, modeling culturally appropriate behavior and attitudes, and providing a great deal of childcare for the working mothers (Billingsley, 1992). If, as the literature suggests, computer access is racially biased in favor of white Americans, cost has hindered personal ownership of computers by African American families (Pearson, 2002), and that generally older adults feel less confident about their ability to use computers (Marquié et

al., 2002; Quadagno, 2005), one could assume that generally older adult African Americans have limited access to computers, may not be inclined to use a computer, and may hold negative attitudes toward computers. However, there is no research that can validate these assumptions.

Attitude Theory

References to attitude theory in the research documenting older adults and computer technology are widespread. However, it can be argued that other than the marginal references that are made for the sole purpose of defining attitude, the use of attitude theory in the research base is non-existent. Ajzen and Fishbein (2000) noted that attitudes are assessed in terms of overall evaluations and they opined that once a set of beliefs is formed and is accessible in memory, it provides the cognitive foundation from which attitudes are assumed to follow in a reasonable and consistent fashion. Fishbein and Ajzen (1975) described attitude as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (p. 6), and according to the Expectancy-Value (EV) Model of Attitude Theory (Ajzen, 2001; Ajzen & Fishbein; Fishbein & Ajzen), "a person's overall attitude toward an object is determined by the subjective values or evaluations of the attributes associated with the object and by the strength of these associations" (Ajzen & Fishbein, p. 4). Figure 1 displays an Expectancy-Value conceptual model based on Palmgreen (1984).

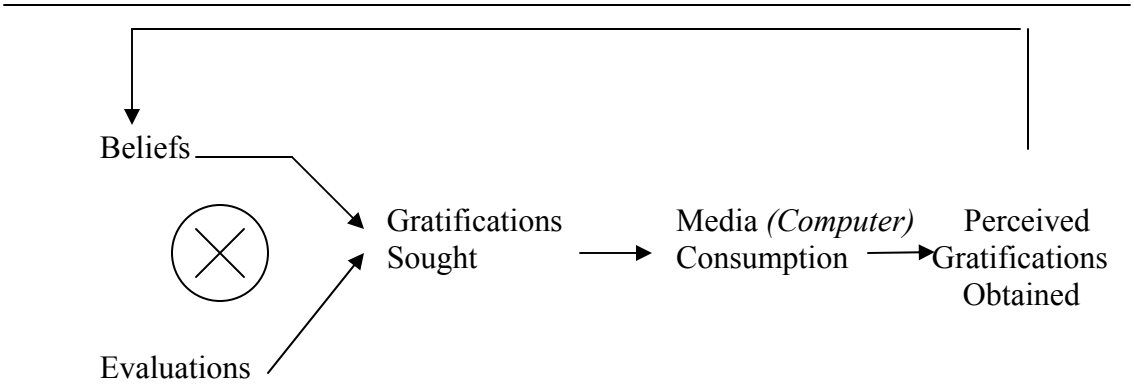

Figure 1. Expectancy value conceptual model.

Attitude theory based on the expectancy-value model is congruent with the assumptions of the literature used in this review. For example, the finding that older adults' attitudes toward computers is modifiable (Czaja & Sharit, 1998) is consistent with an assumption of the model that attitudes are in a sense based upon the beliefs about the attitude object that are presently accessible, and any change in those accessible beliefs, or in the evaluations that are associated with them, can lead to a change in attitude (Ajzen & Fishbein, 2000). The only requirement imposed by the model is that attitudes follow consistently from a set of immediately accessible beliefs, and are arrived at either after considerable reflection, taking into account all available information or after little contemplation that draw only on a small amount of information (Azjen & Fishbein).

After careful consideration of both the problem and the stated purpose of this study, it is appropriate to determine the lens through which the researcher sees the world and the theory in which this research is to be situated therefore the expectancy-value model of attitude theory will inform the findings of this study.

Chapter Summary

This chapter reviewed the literature on older adults and computer technology with particular attention to the attitudes of older adults toward computers. The literature yielded five primary conclusions and the review identified a gap in the literature base with specific reference to the need for research on race as a variable in examining attitudes toward computers. Tracing the history of the education of African Americans, it can be concluded that given the opportunity to learn to use a computer, research is needed to document how older adult African Americans will respond to learning to use a new and innovative technology that was not available in their youth, and the impact of this learning on their attitudes toward this technology.

Therefore, this study sought to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers using a mixed-methods research design to provide a qualitative description of the participants' experiences with a computer, and at the same time examine, through the use of an experimental condition, the participants' attitudes toward the computer as an attitude object. This research design that follows was used to provide insight that neither a purely quantitative nor qualitative design could accomplish by itself. Chapter 3 will explore in detail the methodology used to accomplish this end.

CHAPTER 3

METHODOLOGY

Conceptual Framework

The central premise of the framework that informs this study contends that computer experience–which is characterized as a psychological state reflecting the feelings and beliefs a person ascribes to a computing event–influences attitudes toward computers, and is consistent with the Expectancy-Value (EV) Model of Attitude Theory that emphasizes subjective cognitive "evaluations of the attributes associated with an attitude object, and the strength of these associations" (Ajzen & Fishbein, 2000, p. 4).

The literature showed that computer experience was informed both by actual computer use and vicarious computer interaction (Ansley & Erber, 1988; Baack et al., 1991; Marquié et al., 2002). Accordingly, the nature of the actual exposure to computer use could be either positive or negative and therefore was an important factor that impacted the formation of attitudes towards computers (Czaja & Sharit, 1998; Dyck & Smither, 1994, 1996; Marquié et al., 1994).

Therefore, this study focused on the impact of the computer interaction on the computer attitudes of older adult African Americans by utilizing interviews to explore what the participants experience in an interaction with a computer, and a true experiment to measure the effect of the computer interaction. The Human Subjects/Institutional Review Board of Florida Atlantic University reviewed and approved the research protocol for this study prior to the recruitment of participants.

Research Design

The purpose of this study was to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers. Thus, the study utilized a mixed methods research design that included an inductive approach using interviews to allow for a description of the participants' experiences in the computer interaction, and an experimental design to test the following null hypotheses:

Ho 1: There is no main effect due to training on the adjusted average scores on the computer attitude measure.

Ho 2: There is no main effect due to gender on the adjusted average scores on the computer attitude measure.

Ho 3: There is no interaction effect between training and gender on the adjusted average scores on the computer attitude measure.

The sample for this study was part of an African American cohort of men and women who were born between 1915 and 1943. This population was educated in the legacy of either of two landmark events in the education of African Americans: (a) the "second crusade for black education" which occurred from 1910 to the 1930s, and (b) the Supreme Court decision in Brown et al. *v.* Board of Education of Topeka, KS, that dismantled the legal basis for racial segregation in schools (Spring, 2001).

This cohort was more likely than previous cohorts of African Americans to have had near equal educational opportunities as their white counterparts. Education was important in sample selection for the present study because age and education have been shown to have direct effects on computer attitudes (DeOllos & Morris, 2004). Research has consistently reported that education was directly linked to computer interest and

computer attitudes (DeOllos & Morris; Karavidas et al., 2005; Kelley et al., 1999). The sample used in this study had a similar education level as the Caucasian samples (13 years) used in similar studies, including Jay and Willis (1992), Namazi & McClintic (2003), and White & Weatherall (2000).

Quantitative Methodology

Participants

Best & Kahn (1998) noted that even though there was no fixed number or percentage of participants that determined the size of an adequate sample, 30 or more participants were usually considered large samples. One hundred participants were selected from a population of non-computer users of whom the study intended to generalize. The participants were recruited from organizations that offered programs and/or services for older adults in southeast Florida, including centers and religious organizations (Appendix A). Participants met with the researcher for an overview of the research project and reviewed the selection criteria prior to participation. Basic demographic information was obtained from each participant to ensure that each participant met all the criteria and to determine the characteristics of the sample (Appendix B). The researcher shared the following with the participants: purpose of the study, the expected duration of the participants' involvement, the participants' right to ask questions or to withdraw at anytime from the research, and the description of the procedures to be followed. Each participant was asked to read the consent form (Appendix C) and the researcher ascertained from each participant that the participant understood her/his right of informed consent. Participants were included in the study after giving informed consent.

Participants were screened for 20/40 vision with or without correction. Vision was tested with the Snellen chart (Berson, 1993) to ensure that participants are able to read characters on the computer screen. A battery of tests was performed to determine cognitive ability. The researcher administered the Vocabulary subtest of the Shipley Institute of Living Scale (Participants were asked to circle the word that has the same meaning or most nearly the same meaning as a referent word) and the California Verbal Learning Test-List A1 (Participants were presented with a list of 16 words and asked to recall as many words as they remembered. This was repeated for five trials). Whereas the Shipley Vocabulary (Shipley, 1940, 1986) assessed the knowledge-based facet of the mind and represented an aspect of crystallized intelligence, the California Verbal Learning Test (Delis, Kramer, Kaplan, & Ober, 1987) assessed verbal memory abilities and represented the fluid dimension of intelligence. Participants' average education was 13.68 years and their mean age was 70.55 years with a standard deviation of 7.01. The mean age for male participants was 70 and for females 71.

Table 1

Participants' Ages

		Males		Females	
Group	N	M	SD	M	SD
Treatment	50	68.44	7.445	69.68	7.353
Control	50	71.56	5.229	72.52	7.439
Total	100	70.00	6.559	71.10	7.459

Data Collection Procedure

The study used a pretest-posttest equivalent-groups 2 x 2 factorial design (Best & Kahn, 1998) in order to measure the effect on attitudes toward computers after an experimental period. To ensure equivalence, 100 participants were randomly assigned to either of two groups using 50 as the experimental group and 50 as the control group. Each group was composed of equal amounts of males and females to allow for gender comparison. All the participants were pre-tested using a modified version of the ATCQ.

The experimental condition involved four one-hour computer-training sessions over a four-week period. During the training, participants were taught to demonstrate proficiency in using a computer input device (using the mouse to point, click, double-click, and drag), performing various computer operations (creating, deleting, and saving files), and a computer application (using the Worldwide Web and setting up email) (Appendix D). The training was conducted in groups of 10 in sessions that were held in the education building of a church campus in southeast Florida.

A tutor was available to provide individualized attention to participants who made such a request, while a facilitator provided the instruction for the group. The facilitator for each session was an individual who regularly taught a computer introductory course. The same instructor facilitated all sessions, thus eliminating potential contamination due to differences in instructors' ability.

On completion of training, participants were asked to complete the attitude measure as a posttest in order to assess their attitudes toward computers as a function of the intervention. The control group also completed the attitude measure as a posttest in order to assess attitudes toward computers under a non-intervention control situation. Pre-

and post-testing was conducted individually. On completion of the second administration of the attitude measure the control group was offered an invitation to participate in computer training, similar to that offered to the experimental group, as a benefit for their participation in the study.

Attitude Measure

All the participants completed a modified version of the ATCQ (Jay & Willis, 1992). The modified ATCQ is a 15-item multidimensional scale assessing three dimensions of attitudes toward computers identified in prior research on older adults: comfort (assess feelings of comfort with the computer and its use), self-efficacy (feelings of competence with computers), and interest (the extent to which participants are interested in learning about and using computers). Each dimension is assessed with five items and scored on a 5-point Likert scale with response options ranging from 1- strongly agree to 5- strongly disagree. Scoring for eight of the items (1, 2, 4, 7, 9, 10, 11, and 15) was reversed such that a score of 1 is scored as 5, 2 as 4, 3 as 3, 4 as 2 and 5 as 1. The range of possible scores on the instrument was from 15 to 75 with a higher score indicating a more positive attitude towards computers (Appendix E). The ATCQ was modified by the Center for Research and Education on Aging and Technology (CREATE) and was used in prior research (Czaja et al., (2006). Given the importance of comfort, self-efficacy, and interest as constructs these subscales were retained intact with generally good subscale reliabilities: comfort (.63); self-efficacy (.78); interest (.64). The interclass correlation coefficient was used to test the reliability of the scores and Cronbach's Alpha coefficient of .122 was reported. The interclass correlation was small in this particular study because the three subscales were measuring differing dimensions

of the instrument and each had generally good subscale reliability. It was anticipated that the subscale reliabilities were acceptable. The scale was used in the present study without further modification. The original scale was used in prior research with an older adult sample and details concerning its construction can be found in Jay and Willis.

Data Analysis

At the conclusion of the experimental period the between-groups and within-groups variances were subjected to an analysis of covariance. Using pretest-posttest equivalent-groups in a 2 x 2 factorial design, the study determined whether there was a significant effect due to the experimental treatment, whether there was a significant effect due to gender, and whether there was an interaction effect between treatment and gender. The following hypotheses guided the investigation:

Ho 1: There is no main effect due to training on the adjusted average scores on the computer attitude measure.

Ho 2: There is no main effect due to gender on the adjusted average scores on the computer attitude measure.

Ho 3: There is no interaction effect between training and gender on the adjusted average scores on the computer attitude measure.

All analytical procedures were conducted using the Statistical Packages for Social Scientists (SPSS) for Windows. A .05 alpha (α) level of significance was used as the standard of rejection for the null hypothesis. The analysis of covariance (ANCOVA) was used to determine the effect of computer training on posttest scores after incorporating the effect of differences between pretest scores of the sample populations. An F-statistic was computed to determine whether the population averages were significantly different.

If the F-statistic was larger than the critical value of 4.00 that corresponded with the .05 alpha level, the null hypothesis was rejected in favor of an alternative hypothesis that the population averages differed.

In interpreting the partial Eta squares for the Univariate tests as used in this study, Cohen (1988) characterized the $\acute{\eta}^2 = .01$ as a small effect size, $\acute{\eta}^2 = .06$ as a medium effect size, and $\acute{\eta}^2 = .14$ as a large effect size, describing partial Eta squares as a consistent measure of effect size applicable to all F tests.

Experimental Validity

Campbell and Stanley (1966) identified experimental validity as being of two types, namely: internal validity and external validity. There are many extraneous variables that may be generated in experiment procedures to compromise experimental validity and potentially influence the outcome variables. These threat factors to each type of validity are identified below, along with actions taken to remedy their influence.

Internal validity. Maturation was an extraneous variable capable of threatening internal validity. The potential for incidental learning could have precipitated psychological maturation between recruitment and the first administration of the attitude measure, thus random assignment to experimental and control groups minimized this variable. Also, since participants in the control group were older, pretest scores were used as a covariate to ensure that the groups were comparable prior to the initiation of training.

External validity. In order not to affect the generalizability of this study it was necessary to examine the interaction effect of testing (i.e., completing the attitude measure), which is the primary extraneous variable likely to affect pretest-posttest experimental validity. The pretest was likely to alert the experimental group to some

aspect of growth or change expectation resulting from the treatment intervention, and had the potential of interacting differently with the treatment condition. To control for this variable effect covariance was used to adjust the posttest means for chance differences.

Qualitative Methodology

Data Collection Procedure

Phased interviews were conducted with a small subgroup of the sample in the experimental condition in order to explore the experiences of the participants in a computer interaction. This was a purposeful criterion sample of seven participants who were able to describe the phenomenon under consideration, computer interaction experience. Demographic information for this sample is presented in the table below.

Table 2

Demographic Information for Interview Participants

Participants	Gender	Age	Education
A. B. Participant	Male	65	College
B.C. Participant	Female	76	High School
C.D. Participant	Male	83	High School
D.E. Participant	Male	65	College
E.F. Participant	Male	66	High School
F.G. Participant	Female	72	Graduate
G.H. Participant	Female	67	High School

Interviews

Three 15-minute interviews with each of seven participants selected for this purpose were conducted in phases, namely, before the administration of the ATCQ; after the second week of training; and at the second administration of the ATCQ. The interviews were structured around a protocol, which consisted of open-ended questions that allowed participants to formulate their own conceptions and responses (Appendix F). Interviews were recorded using a small high-quality tape recorder.

Before each initial interview began, the researcher reviewed with each participant, the purpose of the study, the expected duration of the participant's involvement in the interviews, the participant's right to ask questions, the right to withdraw at anytime from the project, and the description of the procedures to be followed. After the participant gave informed consent to participate in the interviews, the participant was asked to choose a pseudonym to protect her/his identity. Participants participated voluntarily.

Data Analysis

Data were analyzed inductively using the constant comparative method (Glaser & Strauss, 1967). In this method, data analysis proceeded simultaneously with data collection. As the interviews were conducted and transcribed, the researcher read, re-read, and coded the transcripts for key points and possible themes. By constantly moving between the data and the interpretations within the same transcript and across different transcripts, a tighter structuring of the data emerged. This process resulted in findings that were sensitive to the data and that reflected the researcher's interpretation of the participants' understanding of the computer interaction experience and how it influenced their attitudes toward the computer.

Validity

An assumption of the present research was that what is reported in the interviews was the participants' construction of reality–how they understood their computer interaction experience. The participants were the primary instruments of data collection and analysis, thus interpretations of reality were accessed through the interviews. To establish internal validity member checks were applied, allowing data and tentative interpretations to be taken back to the participants from whom they were taken to verify whether the results were accurate (Merriam, 2001).

Reliability

Reliability was established through the use of an audit trail following the method suggested by Merriam (2001): "In order for an audit to take place, the investigator must describe in detail how data were collected, how categories were derived, and how decisions were made throughout the inquiry" (p. 207). The present study viewed external validity as reader/user generalizability and therefore provided thick rich data to enable the reader/user to determine the comparison with their respective research context.

Chapter Summary

The review of the literature in the second chapter identified a significant gap in the knowledge base due to the paucity of research on race/ethnicity issues as they relate to older adults and computer technology. The review concluded with a suggested need for a mixed methods research methodology that would provide insight that neither a quantitative nor qualitative design could accomplish separately. Chapter 3 provided a conceptual framework for the study and detailed a mixed-methods design using a true

experimental design and a qualitative inquiry. Chapter 4 will present the findings of the study.

CHAPTER 4

RESULTS

The purpose of this study was to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers. As aforementioned, the constructs that have received the most empirical attention in the literature on older adults' use of computers are experiences with, and attitudes toward, computers. Previous studies of older adults' computer attitudes have found that greater experience with computers is associated with more positive attitudes (Czaja & Sharit, 1998; Danowski & Sacks, 1980; Dyck & Smither, 1994, 1996; Jay & Willis, 1992; Kelley et al., 1999).

Although the evidence suggests that direct computer use can influence older adults' attitudes toward the technology, it has never been determined whether this is true of the older African American population, also, an examination of the relationship between experience and attitude seemed necessary to determine the circumstances under which the interaction with computers can be found to create either positive or negative attitudes for older African Americans.

Quantitative Analysis

The study used a pretest-posttest equivalent-groups 2 x 2 factorial design in order to measure the effect on attitudes toward computers after an experimental period. To ensure equivalence, 100 participants were randomly assigned to either of two groups using 50 as the experimental group and 50 as the control group. Each group was

composed of equal amounts of males and females to allow for gender comparison. All the participants were pre- and post-tested using a modified version of the ATCQ, which is a 15-item multidimensional scale assessing three dimensions of attitudes toward computers identified in prior research on older adults: comfort (assess feelings of comfort with the computer and its use), efficacy (feelings of competence with computers), and interest (the extent to which participants are interested in learning about and using computers). Each dimension was assessed with five items and scored on a 5-point Likert scale with response options ranging from strongly agree to strongly disagree.

The research questions and hypotheses are restated below along with a summary of the analysis procedures, inferential statistics related to the research questions and conclusions for each hypothesis as follows:

Research Question 1: Does attitude towards computers differ for older adult African Americans who receive computer training, and those who do not?

H*o* 1: There is no main effect due to training on the adjusted average scores on the computer attitude measure.

Research Question 2: Is there a distinction in computer attitudes between older adult males and older adult females in the African American population?

H*o* 2: There is no main effect due to gender on the adjusted average scores on the computer attitude measure.

Research Question 3: Is there an interaction effect on computer attitudes as moderated by training and gender?

H*o* 3: There is no interaction effect between training and gender on the adjusted average scores on the computer attitude measure.

The data gathered for this study were analyzed using a 2 x 2 Factorial ANCOVA. The between-groups independent variables were training condition (experimental or control) and gender (male or female). The dependent variable was posttest computer attitude score. The covariate was pretest computer attitude score.

Table 3

Mean and Standard Deviation Totals From the Modified ATCQ Pre- and Post-treatment

		Pretest		Posttest	
Group	N	M	SD	M	SD
Experimental Group					
Males	25	51.72	5.828	68.04	5.037
Females	25	53.76	5.960	69.56	7.611
Control Group					
Males	25	54.88	6.194	54.52	6.259
Females	25	53.00	5.066	53.60	4.796

The assumption of homogeneity of variance across groups was met as measured by Levene's Test of the Equality of Error Variances ($F(3, 96) = .341$, $p > .05$).

Hypothesis Testing

Research question 1. Does attitude towards computers differ for older adult African Americans who receive computer training, and those who do not? The accompanying hypothesis: H*o*1: There is no main effect due to training on the adjusted average scores on the computer attitude measure. There was a significant main effect of training condition, ($F(1, 95) = 145.163$, $p < .05$, $\acute{\eta}^2 = .604$). Therefore, the data rejected the Null Hypothesis of no training effect. The data revealed a large effect size, partial $\acute{\eta}^2$

= .604. Across all the participants in the experimental group, scores increased between 16 and 17 points on average after training.

Table 4

Analysis of Covariance Summary for the Attitudes Toward Computers Questionnaire Posttest Scores

Source	SS	df	MS	F	Sig.	Partial Eta Squared
Corrected Model	5510.215	4	1377.554	37.907	.000	.615
Intercept	5047.059	1	5047.059	138.885	.000	.594
PRE	39.065	1	39.065	1.075	.302	.011
GENDER	2.384	1	2.384	.066	.798	.001
GROUP	5275.209	1	5275.209	145.163	.000	.604
GENDER x GROUP	50.081	1	50.081	1.378	.243	.014
Error	3452.295	95	36.340			
Total	386327.000	100				
Corrected Total	8962.510	99				

Research question 2. Is there a distinction in computer attitudes between older adult males and older adult females in the African American population? The accompanying hypothesis: H*o*2: There is no main effect due to gender on the adjusted average scores on the computer attitude measure. ($F(1, 95) = .066$, $p > .05$, $\acute{\eta}^2 = .001$). Therefore the data failed to reject the Null Hypothesis of no gender effect.

Research question 3. Is there an interaction effect on computer attitudes as moderated by training and gender? The accompanying hypothesis: H*o*3: There is no interaction effect between training and gender on the adjusted average scores on the computer attitude measure. ($F(1, 95) = 1.378$, $p > .05$, $\acute{\eta}^2 = .014$). Therefore the data failed to reject the Null Hypothesis that Gender and Training (Group) had no interaction effect.

Qualitative Analysis

In order to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers a qualitative approach was employed to answer the following research question: *What is the computer interaction experience of older African Americans?* Three 15-minute interviews with each of seven participants selected for this purpose were conducted in phases, namely, before the commencement of training; after the second week of training; and at the completion of training. The interviews were structured around a protocol, which consisted of open-ended questions that allowed participants to formulate their own conceptions and responses. Pseudonyms were used to protect the identity of each participant.

Interview Findings

Three major findings were identified in this phase of the investigation. First, positive disposition towards computers elicited a positive attitude towards the technology. Second, the computer interaction experience was motivated by the need for self-efficacy. Third, as participants reflected upon their interaction with the computer they formulated personal meanings derived from the interaction.

Positive disposition towards computers. A significant finding in this study was that motivation to use the computer was precipitated by an attraction for the technology. Though the participants had not used a computer they reached the conclusion that the acquisition of computer skills was to be a positive experience. This conclusion was derived either on the basis of self-reports of computer users or observation of the actual computer usage by others. A.B. Participant, 64, shared two situations that inspired his interest in acquiring computer skills. The first was with his wife:

> I would look at Eve (name changed to protect her identity) using the computer and knowing that I cannot use the computer, it aroused an interest. I feel that I should be able to do that as well. I never really, you know, got into it. When we first purchased the computer I should have gotten into it but I didn't, and you know, Eve where she used to work she had to use the computer and her employers provided training. I never really had an opportunity for training because I didn't need a computer for my job, so I pretty much would have had to learn on my own and I never really took the time to do that.

The second situation A.B. Participant shared involved a friend who was assisting him with downloading information from the Worldwide Web:

> My friend did something that just let me know it was time to learn how to use the computer. He entered my address into his computer and up came an aerial view of my neighborhood with an arrow pointing to my house. My actual house was on the screen. You know, I just could not believe what I was seeing. I knew that I had to learn how to do that.

B.C. Participant, 76, is a retired domestic worker and a great grandmother of twelve. She lived in a home that did not have a computer. Her interest in computers was formed on the basis of self-reports of two great grandchildren and a grandson who shared a residence with her. She said the following:

> I do not have any fears about using a computer. Maybe it's because I don't know anything about it. I know what it looks like but I have never handled or touched a computer. I hear the children talking about how they use the computer at school, and they say it's fun, so I want to see for myself. I am very interested in learning how to use it.

C.D. Participant, 83, was the oldest male in the study and retired from both federal and county employment. He constantly observed his daughter and his grandchildren on the computer and it aroused his interest in using the technology. This is how he stated his interest:

> My daughter spends a lot of time shopping on the computer and the children; they play games and so on. So I look forward to sitting at the computer and do all the things that will interest me. Hey, I guess I won't be going to bed until late. You know I plays *[sic]* a little golf and my buddies, some of them uses *[sic]* the computer for information and so on, so I guess I will be able to do all the things they talk about.

In summary, the first finding answered the research question by identifying that the computer interaction experience begins with a positive disposition towards the computer. However, since participants were non-computer users their positive disposition towards the technology was elicited by self-reports of actual computer users or on the participants' observation of actual computer use by another person.

The need for self-efficacy. Four of the participants that were interviewed lived in a house with a computer that was used by family members, including children and grandchildren. One participant lived alone and owned a laptop but had no computer

skills, and the other two participants did not have a computer at home. Participants reported of seeking the assistance of family members in downloading information from the Internet and added that seeking assistance seemed to interfere with the routine of others. Five of the participants identified the need to be able to use the computer independent of the assistance of others as the primary reason for volunteering to participate in the study. Describing his experience of asking his spouse for assistance, D.E. Participant 65, who co-owns a catering service with his wife, stated:

> You know, it's like a bother. She would never explain to me what she is doing, she would just do it without showing me and that is not helping me in the least. What I need is for her to show me what to do and not do it for me. If I know what to do, I can do it for myself. But I know that she is busy and sometimes I feel I am just getting in her way.

A.B. Participant reported a similar experience while seeking the assistance of family members:

> Initially there was an attitude in which they came, you know, with open arms to help when I asked them to do this or that for me. But now it is like, 'You should be learning to do this by now.' I kind of shied away from learning to use the computer because I knew I could call on my wife, or if the girls (a reference to his daughters) are at the house one of them would help me with things I want to look at on the Internet. But after a while, you know, it gets annoying for them.

C.D. Participant reported of never having to ask anyone for assistance with the computer simply because he had no need for such assistance. However, he was curious about the computer and desired to learn how to use it.

> I am here because I wants *[sic]* to be able to use the computer for myself. I am not going to ask my daughter or the grandchildren because I know they really don't have the time to help me and these young people really don't want to help you do nothing *[sic]*. By me learning to use the computer, I don't have to ask them for help. That's the way I feel.

For one participant, the desire to acquire computer skills was a significant development considering his earlier resistance to using the technology. E.F. Participant, 66, retired a year ago from his job and at that time he said he had commented that it was "not a minute too soon." He was opposed to the installation of computers as part of his work equipment:

> When they (a reference to the company for which he had worked) decided to install computers on our work trucks I was determined that they will have to drag me to the computer kicking and screaming, I kid you not. I am a person who does not take too kindly to change. We were told that the decision to install the computers was to guarantee efficient services. Completing a work order would have required me to type data into a computer and that information would then be transferred to the main office…. They had all these computer geniuses there to demonstrate how to use the computers. At that time I was sure that there was no way in hell that I could use that thing. It was complicated for me and I kept forgetting to hit the button to enter the stuff…. I was straight up with my supervisor and the H.R. (a reference to Human Resources) people. I had eight months to retirement and I did not want to be in the first fleet assigned to try out the new system. They understood and I never had to use the thing. At that time I thought that retirement was not a minute too soon. In retrospect, I think I should have at least tried. A few months ago I was thinking that I may never know what I missed out on. That's part of the reason that I'm here. Until last year there was no challenge that I couldn't face then came the work truck computers. For the first time in my adult life I felt that I was about to lose my independence. Do you know what that can do to a man facing retirement? Well, come hell or high water, I will learn to use this thing.

Participants reported that during the computer training there were moments when they were overcome by feelings of trepidation due to difficulties they encountered while learning to use the computer, and required the assistance of either, the instructor, the tutor or another study participant. A.B. Participant shared this experience:

> You know, when I first sat down at the computer, I didn't know, but I just kind of became afraid of using it. And I am somewhat still afraid since I am not always sure of what I am doing. I am always afraid that I will lose

> something that I have on the screen by moving ahead on something and not being sure on how to get back to where I was.

F.G. Participant, 72, a retired teacher with forty years of service to a local school district relied on the support of the instructor and described her experience in the following way:

> It is not that I deserve any special treatment but several times I have had to interrupt the young woman… the one that teaches the class. I know that some of those people in the class probably wished that I was not there but I had never used a computer before and I needed for her to explain some of the terms for me, and I was expecting her to be hands-on with the use of the mouse and to do it at my pace. I am not as sharp as I used to be. She hasn't complained so I guess she thinks I am a special project.

E.F. Participant reported of his reliance on the support of the instructor and the tutor during what he thought was a potential difficulty during the training:

> I think it is a little too early to really reflect on this experience. What I can say is that there is much more to the computer than I learned when they were getting ready to install them (computers) on our work trucks. I have learned much of the computer lingo. And the teachers in the class, they are very patient, no kidding. I told them on the second day that I don't think I would be able to manage all that clicking and stuff but they helped me. At first…. I knew it was going to be a challenge because my fingers are big and they kept touching buttons they were not supposed to touch, then I was having problems doing the two click thing… but no, they (a reference to the instructor and tutor) helped me.

B.C. Participant shared the difficulties she was experiencing and of the assistance she received from another participant in the study:

> I am trying and I will continue to try. I can't remember the names of all the computer parts but I wrote them down in the first class and they also gave us the names on a sheet of paper. So, I will try to learn them before the class is finished. But so far, the class is hard. At first I could not move the little things on the screen (a reference to dragging icons on the desktop) with the mouse, but D.E. Participant (pseudonym used to refer to another participant in the study) helped me. He also showed me how to delete the letter we had to type because I was clicking the wrong side of the mouse and it would keep on opening the letter…. Last week I felt like dropping out but I think I will stay.

Like B.C. Participant, C.D. Participant seemed to have had the most difficulty operating the mouse to perform actions such as dragging and clicking, as was evident in his comment:

> Yes, it was more than I thought. Normally, I tries *[sic]* my best but it was difficult to click the mouse and do other things with it. Ask anybody and they will tell you I play cards and dominoes all the time but I had problems playing solitaire with the computer because I could not move the cards properly. I took the longest time…. Trying to do the two clicks, that was difficult.

The difficulties aside, participants also reported of relying on significant others to reinforce what they had learned during the training and to acquire additional computer skills not offered in the training module. D.E. Participant reported on his acquisition of additional skills with the assistance of family members who were proficient in the use of the computer:

> At first I thought it was going to be hard but by the end of the second session I realized that it wasn't all that bad. I remember thinking after the class that they needed to teach us other things before they move on to introducing the internet. There were other things that I wanted to be able to do and there are tons of things that I am sure that I still haven't learned to do. For instance, there are things that my wife can do, like a spreadsheet. Not that I have need to use a spreadsheet, but there are things that I still need to be able to do on my own… My daughter is really good on the computer and last weekend she helped me to learn some other things. I am doing things I never thought were possible. I can scan pictures and save them in a folder. As a matter of fact, we have already scanned more than one hundred family pictures, so if we lose a picture we can always reprint it from the computer. She is real proud of me. I was also showing my wife some of the things I learned and she was impressed. She showed me something that I did not know could happen, to actually bring a document back to the monitor by going into the computer recycling bin and restoring it. She also showed me how to delete a document from the recycling bin so that nobody else can open it.

G.H. Participant, 67, retired five years ago and has been caring for her aging aunt. She shared the following experience involving significant others in her computer interaction experience:

> My first thoughts when I sat at that computer was *[sic]* somewhat negative. I did not believe that I could actually use that computer and I really did not have to learn to use it. My daughter, my sons and all my grandchildren can use the computer and they would help me if I needed it. My granddaughter would always say to me 'Nana, let me show you how to use the computer.' But I would always refuse. This time I said to myself, 'Alexis, you have nothing to lose.' It might not be the best decision I ever made but it is a very good decision. Trying to remember certain things, especially the names of the parts was a little difficult initially but now it's all good. Using that computer was easier than I thought it would have been…. I was with my daughter and granddaughter this past weekend and we were on the internet, yes, the internet. I told them that I will be learning to use the internet in the class so they showed me how to get on so I can have an idea as to what to expect. To be honest, I was never interested in the computer before now. I visit my daughter all the time and that computer never interests me. I would watch the television for my favorite shows while my son-in-law and my granddaughter would be fighting over who is on the computer too long.

The participants also recognized that their desire for self-efficacy required the ability to adapt. According to D.E. Participant, "This is the computer generation. Today's children are born into this while the older generation has got to adapt". C.D. Participant shared a similar sentiment, "Kids today are born into a *[sic]* era of computers so it comes easy to them. We are from a different era, but we can learn. We got to put our mind to it that we want to learn it".

In summary, this second finding answered the research question by describing the computer experience as one that involved the need for self-efficacy or the need to be able to use the computer without the assistance of others. The motivation towards self-efficacy was related to participants' perception that there was the expectation that they should be

able to use the computer independently. Participants also recognized that having not been raised in an epoch that required computer skills learning may be difficult but it was necessary in order to adapt to the prevailing circumstances.

Construction of personal meaning. All the participants seemed to agree that a lack of both interest and personal relevance of computers in their daily living is the primary reason older African Americans do not readily report having an interest in acquiring skills to use computer technology. F.G. Participant stated her disinterest in this way:

> I really am not interested in volunteering for the training because I am not interested in computers. I would be perfectly satisfied with just sharing my opinion on the questionnaire. But since you chose me, here I am.

G.H. Participant echoed a similar sentiment when she said: "I honestly have never been interested in using a computer. What would I need it for? I don't work anymore and I don't have plans to work again. So?"

Agreeing that older African Americans need to be able to relate personal meaning to their computer experience one participant suggested the following:

> You have to appeal to interest especially in the case of our people. Usage boils down to where your interest lies. My daughter is a teacher, her husband is a chef and they both use the computer but for different reasons that are related to individual interest. To get people interested in computers I would make it relate to their lives. I would ask them, 'What is your main interest?' Suppose they say 'Baseball,' then I would ask, 'How would you like to know everything in the world there is to know about baseball?' 'Where are the balls made?' 'Who invented the sport?' Then I would tell them the answers are on the computer. I would appeal to their interest.

By the conclusion of the training period it was evident that participants had begun to make sense of the computer interaction experience by making an interpretation of it. It was evident that their construction of meaning was more transformative in nature as they

reinterpreted this new experience from a new set of expectations that arose out of reflection on their prior assumptions, biases, and beliefs. This is how D.E. Participant described his experience:

> The computer has put the entire world at my fingertips. There is no knowledge that I can't get. Science, medicine, animals, plants, whatever I want to know about, it's in there. Never in my life would I have thought that I would be interested in that kind of knowledge at my age. I just typed in a few words, hit enter and all this information just jumped out at me. My first thought was 'This ain't too bad'. I like music so I started looking up songs. Some of the songs I sing at church, I have gone online and researched them. I typed in the name and everything came up, lyrics and all. I was even able to play some of them. I have also looked up real estate. Everything there is to know is accessible through the computer. I have access to information that my daddy never had and to think that it will probably get even better by the time my grandson reaches college. We may not know it but the computer will change the way we learn.

A.B. Participant reflected this way on his journey up to the point of the interview and the personal meaning that the computer interaction experience can have on him and his peers:

> At one time I thought that I would never want to know how to use a computer, you now, but I am beginning to think differently. So there are many of my colleagues and personal friends of my age, some older and some younger, who like me, do not have an open mind; and even though they might probably feel that I am a step ahead of them, learning something that they do not know, you know, still they might not be willing to change. People get stuck in their ways, especially since in their time there were no computers. They will probably say, 'Well I got through without it, why do I need it now?' Don't forget now, the computer is something that you have to learn how to use and you have to want to learn how to use it. Now, if they are not willing to take the time or have an interest, you know, they will not do it.

A.B. Participant went on to make a comment that points to his construction of meaning in the computer interaction experience:

> The problem with people my age is that we are content with the way things are. That is what makes us different from the young people. Young

> people are not afraid to try new things. For years I had supplemented my income by cutting a few lawns, mostly for people I knew. I stopped a few years ago. I tried that because it was not difficult, you know, even though it was physical labor. Now, I am looking at possibilities to do new things in retirement. Look at White folks, when they retire they remain active, they return to work or volunteer, you know. They volunteer at the library in my neighborhood. One of my former co-workers who worked on a delivery route, retired and now he works at Sears Automotive and using a computer. African Americans on the other hand seem content to retire and sit at home. Why? Probably because we don't have the skills these employers are looking for. Knowing how to use a computer, I will be marketable. There are advertisements, you know, seeking people who can use computers and can work from home on a part time basis. I will definitely be looking to get some additional training for those kinds of jobs to keep me active.

C.D. Participant's construction of personal meaning related the acquisition of computer skills to individuals regardless of gender or age:

> I always used to think that women used the computer more than men because men had better things to do. Women worked all the time with the computers. First it was the typewriter and then the computer. When I worked for the county the women spent a lot of time on the computer and they were good at their work. The way I sees *[sic]* it was that that was their thing. Then I begin *[sic]* to see men on the computer and they were just as good as the women. I used to watch them all the time. Then when my daughter, she bought one and those kids were on it all the time and I used to watch them too. Now I know a little something about computers and I feel real good. I don't think being a man or being my age should stop you from learning the computer. If you put your mind to it, you will learn.

F.G. Participant did not seem quite as optimistic as her peers in the study but her reflection on the experience led her to recognize a new way to access information. She stated:

> I don't know if this experience has changed me in any significant way. I have learned how to do some things. I have used the internet and during the last class and I emailed my daughter, my brother and my girl friend and they told me they got it. Maybe I am old fashioned but I don't appreciate emailing. Others may not agree, but I am entitled to my opinion and I think it is too impersonal and it takes away from the few opportunities we have for person-to-person communication. We already

> do not talk with each other enough, and the email will worsen the situation. Don't get me wrong I think the computer is a good thing. At first I did not think so but I have seen how it works and it is okay. I don't care for all the mumbo jumbo (a reference to creating, saving and deleting a document), personally I will use it strictly for the internet access. I have a new laptop at home that I can start and shut down. I really did not have the time to use it but my girl friend will help me get it connected to the internet soon. What I do know is that after this course I have an appreciation for a new way to get information. I like to keep up on the news so I was able to visit the Miami Herald website and read the news. I also visited the Channel 7 website so I do not have to worry about missing the 5 o'clock news. I can always go to the web for the news… In that sense, this course has changed my life because I can now appreciate the use of the computer to get information.

In summary, the third finding answered the research question by identifying the construction of personal meaning as the final step in the process that described the computer interaction experience. In this process participants reinterpreted this new experience from a new set of expectations that arose out of reflection on their prior assumptions and beliefs concerning the personal relevance of computers in their daily living.

The findings derived from inductive analysis of the data regarding the computer interaction experience of the participants described a process that involves valence towards computers, which elicits a positive disposition towards the technology; a nascent motivation for self-efficacy; and the construction of personal meaning derived from reflection on the computer interaction experience.

Chapter Summary

In Chapter 1 the problem was stated along with the purpose statement and the research questions and hypotheses. Chapter 2 highlighted the main literature used to support the significance of the study, identified a gap in the literature base with specific

reference to the need for research on race as a variable in examining attitudes toward computers, and introduced the expectancy-value model of attitude theory in which the study is situated. Chapter 3 presented the mixed-methods design that was used in the study paying attention to sampling, data collection, analysis procedures, and issues related to reliability and validity. Chapter 4 reported a quantitative analysis of the data, summarized the procedures, provided the inferential statistics related to the research questions and the conclusions for each hypothesis. The chapter also reported findings of the qualitative inquiry related to a single research question, *What is the computer interaction experience of older African Americans?*: (a) positive disposition towards computers, (b) the need for self-efficacy, and (c) construction of personal meaning. Chapter 5 will summarize the study, discuss the relevance of the findings, state conclusions, and suggest recommendations for future research.

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The previous chapter yielded major findings that emerged out of the statistical and inductive analyses of the data collected for this study. This concluding chapter summarizes the purpose and methodological procedures of the study, discusses the implications of the findings, states conclusions that are generated from the discussions, and offers recommendations for future research.

Summary of the Purpose and Procedures

Studies have confirmed that ordinarily older adults are less likely to consider information communication technology (ICT) of use to them (Russell & Drew, 2001). Brickfield (1984) found that older adults had more negative attitudes toward computers and other technologies, and were less likely to use them than younger adults. Conversely, research has also found that there is no difference between older and younger adults in their attitudes towards computers (Czaja & Sharit, 1998; Kelley & Charness, 1995; Morrell & Echt, 1996).

In 1993, older adults accounted for 24.2% of those age 55-64 and 4.9% of adults over age 65. By 2003, computer usage among adults age 50-64 showed a 12% increase, while older adults over the age of 65 recorded a 20.1% increase in computer usage, accounting for 25% of all adult users (Pew Internet and American Life Project, 2005).

Though research has consistently identified the correlation between access and cost (Pearson, 2002; Kelley et al., 1999) there seems to be little investigation into the psychosocial factors that influence attitudes of African Americans toward computers. Stanley (2003) found that there is a complex relationship between ethnicity, identity, and attitudes associated with computers that significantly undermine motivation for acquiring computer skills. However, there was no research that can validate this finding as it relates specifically to older African Americans.

The evidence suggested that direct computer use could influence older adults' attitudes toward the technology however, but it had never been determined whether this was true of the older African American population, thus the purpose of this study was to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers. The following research questions were answered:

1. Does attitude towards computers differ for older adult African Americans who receive computer training, and those who do not?

2. Is there a distinction in computer attitudes between older adult males and older adult females in the African American population?

3. Is there an interaction effect on computer attitudes as moderated by training and gender?

4. What is the computer interaction experience of older African Americans?

Data needed to answer Questions 1, 2, and 3 were collected through the random selection of 100 participants who were assigned to either an experimental or a control group. Each group was composed of equal amounts of males and females to allow for gender comparison. All the participants were pre- and post-tested using a modified

version of the ATCQ. The experimental condition involved four one-hour computer-training sessions over a four-week period. At the conclusion of the experimental period the between-groups and within-groups variances were subjected to an analysis of covariance using pretest-posttest equivalent-groups in a 2 x 2 factorial design.

In order to answer Question 4 a purposeful sample of seven participants were selected from the experimental group to participate in three 15-minute interviews conducted in iterations, namely, before the administration of the ATCQ; after the second week of training; and at the completion of the ATCQ. The interviews were structured around a protocol, which consisted of open-ended questions that allowed participants to formulate their own conceptions and responses. Inductive analysis of this data was conducted with the use of the constant comparative method (Glaser & Strauss, 1967).

Discussion of Findings

Quantitative Findings

The quantitative analysis yielded three major findings that answered the three corresponding research questions: (a) attitudes differed for older African Americans who receive computer training and those who did not; (b) there was no distinction in computer attitude between older adult males and older adult females in the African American population; and (c) there was no interaction effect on computer attitudes as moderated by training and gender.

Training differences. This finding was consistent with prior research on older adults' computer attitudes that have found direct experience with computers to be associated with more positive attitudes towards the technology hence training was an effective means of change (Czaja & Sharit, 1998; Danowski & Sacks, 1980; Dyck &

Smither, 1994, 1996; Jay & Willis, 1992; Kelley et al., 1999; Morris, 1994; Segrist, 2004). Specifically, intervention studies conducted by Czaja & Sharit, Jay & Willis, and Kelly et al. using the ATCQ found significant positive change on two of the attitude dimensions targeted by this study: computer efficacy and comfort. For example, Jay and Willis reported increased scores on both of these dimensions, from pretest to the second administration, to be significantly greater for the training group than for the wait list (control) group.

Stating the importance of the intervention design in eliciting attitude change, Jay & Willis (1992) referred to their study as follows:

> The computer training was structured such that the participants would experience success in operating the computer and would feel comfortable doing so. As such, the information participants acquired through the computer experience was most relevant to the comfort and efficacy dimensions. (p. 254)

Their results indicated that there was a relationship between the nature of the computer experience (training) and the specific nature of the attitude change.

According to Baldi (1997) and Marquié et al. (1994), older adults were not afraid of computers, instead, their lack of contact with, and lack of knowledge regarding the innovative effect of computer technology resulted in their avoidance of the technology and disinterest in pursuing the relevant training. In the current study, the finding of greater positive computer attitudes for the experimental group on post-test scores demonstrated a relationship between training and improved computer attitudes.

In general, this finding supported the proposition in the literature that given an opportunity to learn the technology with success, older African Americans' attitudes

toward computers can be modified based upon the perceived gratifications. This finding was consistent with the assumption of the expectancy-value model of Attitude Theory which states that attitudes are based upon the beliefs regarding the attitude object, in this case the computer, that are presently accessible, and that any change in those accessible beliefs, or in the evaluations that are associated with them, can lead to a change in attitude (Ajzen & Fishbein, 2000).

Gender comparison. This study found that there was no distinction in computer attitudes between older adult males and older adult females in the African American population. This finding was consistent with the seminal finding in this regard, Czaja and Sharit (1998):

> The data indicated relatively few gender differences in attitudes. Specifically, women experienced a greater increase in comfort with computers following task experience than did men… These findings largely refute the suggestion that women are less receptive and have more negative attitudes toward computers than men. (p. 339)

In the knowledge base, however, intervention and non-intervention studies that have investigated gender differences have yielded disparate results. Czaja et al. (2006) reported that overall, women reported higher computer anxiety, lower computer self-efficacy, lower general computer attitudes, and less interest in computers than men. In the discussion of their findings, Karavidas et al. (2005) noted the following:

> The results of this study suggest that there is a gender gap. Males are found to be more adept at computers than females. Females did not enjoy the same comfort

level with computers or the same computer knowledge as their male counterparts even though they used the computer at the same rate as males. (p. 708)

Unlike the present study, the two aforementioned studies were non-intervention assessment studies with samples that included older adult computer users with likely varying levels of computer efficacy. One could argue that gender differences in computer contexts was responsible for the reported differences found in those studies, since older males were more likely to have prior computer usage experience that was more extensive than their female counterparts (Namazi & McClintic, 2003; Sherer, 1997). However, given a level playing field, women would report similar levels of computer efficacy.

The literature review highlighted the inconclusive results between the two investigations by Dyck and Smither, (1994, 1996) on the relationship of computer anxiety to computer experience, gender, and level of education. The 1994 assessment study found no difference in computer liking between older adult males and females, while the 1996 experimental study examined the relationship between gender and computer attitudes and found that female older adults displayed more negative attitudes toward computers than male older adults. Also, results from computer liking, computer anxiety, and computer confidence scales revealed that females had less positive attitudes than males.

The authors conceded that their findings deserved closer examination and assumed that it might be related to the fact that the participants in the second study volunteered to participate in a computer course, and that considering the number of married couples who participated in that study it was probable that husbands initiated the course involvement while the wives may have been reluctant participants.

However, in describing the research design of the second study the authors stated that there was limited prior computer experience among some participants, but did not provide any gender comparisons relative to computer experience. Accordingly, since research has found that males are more likely to know more about computers than females (Namazi & McClintic, 2003; Sherer, 1997), it can be argued that the finding in Dyck and Smither, (1996) was attributable to sample bias and that without any evidence of gender comparison for prior computer experience, the finding was disputable.

Experimental studies, including the present study, which found no gender differences, were conducted with either novice computer users or participants with similar computer experience hence a level playing field was established at the outset. These studies also noted no differences in prior computer experience according to gender. The present study concluded that gender has no effect on the computer attitudes of older African Americans.

Conversely, the descriptive studies that have investigated for gender differences in attitudes toward computers were essentially assessment studies that have dominated the knowledge base. However, it can be argued that unlike intervention studies, assessment studies, though important to the field, cannot adequately investigate computer attitudes.

In order to elucidate the point, this researcher began by observing that the adjusted mean scores on the ATCQ for participants in the present study indicated positive attitudes toward computers in pre- and post-test administrations for both experimental and control groups. Therefore, this researcher posited the view that given the pervasiveness of computers in contemporary society, it was likely that older adults

already possessed either a positive or a negative attitude towards the technology based on beliefs. The expectancy-value model stated that there are two kinds of belief: *belief in* something and *belief about* something. Attitudes toward computers are informed by evaluations and beliefs *about* the expected outcomes or gratifications associated with computer usage and that was what a respondent would report if she or he was asked. In the literature Baack et al. (1991) described this phenomenon as a "vicarious" experience with computers, which was based solely on a personal belief about computers rather than actual exposure to the technology.

Training and gender interaction. The study found that there was no training by gender interaction effect, indicating that women who were trained to use the computer were just as positive in their attitudes toward computers as were men who were trained. The absence of an interaction effect was important to this study because an interaction would have indicated that the training was more effective for one gender group than for the other.

Except for the study by Czaja and Sharit (1998) that found a significant Gender x Task Experience interaction only on the comfort dimension of the ATCQ with women experiencing a greater increase in comfort with computers than men did following task experience (but found no Gender effects for overall attitudes toward computers) there was a dearth of literature with which to compare. This researcher believes that the lack of sufficient experimental research that investigates for training x gender interaction effects raises a concern regarding research design in examining computer attitudes.

Qualitative Findings

Question 4 was answered by three findings that emerged from inductive analysis: (a) participants exhibited positive disposition towards computers which elicited a positive attitude towards the technology, (b) participants had a nascent need for self-efficacy, and (c) participants constructed personal meaning as a result of their reflection on the computer interaction experience.

Positive disposition towards computers. Though participants seemed to agree that a perceived lack of interest and relevance of computers in daily living was the primary reason that older African Americans do not avail themselves of the technology, this study found that prior to the treatment intervention participants had a positive disposition towards computers and reported positive attitudes toward the technology even though they had never used it. B.C. Participant provided this insight into the issue:

> I never had an opportunity to use a computer and nobody ever offered to teach me so I would like to learn how because I think it is a good thing… I do not have any fears about using a computer. Maybe it's because I don't know anything about it. I know what it looks like but I have never handled or touched a computer…I am very interested in learning how to use it.

This phenomenon however, was not peculiar to the participants in the present study since earlier studies have found that overall older adults have positive attitudes toward technology even though they have no history of usage:

> The older adults seemed to believe that computers and technology were creating positive changes in overall lifestyle and, although they seemed reluctant to pursue "hands on" involvement with computers, they were not terribly anxious about them. Their somewhat vicarious experiences with

> computers probably contributed to their overall positive attitudes toward computers. (Baack et al., 1991, p. 427)

Other findings in the literature support the view that overall older adults reported a positive attitude towards computers motivated by a psychological state reflecting beliefs and evaluations directed to a particular subjective computer experience. Ansley and Erber (1988) reported that participants in their study reported positive attitudes towards computers at pretreatment and maintained consistency in their attitudes after the treatment intervention, indicating positive attitudes toward computers prior to computer usage. The assessment study by Dyck and Smither (1994) found that older adults reported low computer anxiety as measured by the scales used in the investigation, had positive attitudes toward computers, and liked computers despite having little experience using a computer.

These findings are consistent with the expectancy-value model of Attitude Theory which indicates that "a person's overall attitude toward an object was determined by the subjective values or evaluations of the attributes associated with the object and by the strength of these associations" (Ajzen & Fishbein 2000, p. 4). Consider the following comment by a participant:

> My daughter spends a lot of time shopping on the computer…I look forward to sitting at the computer and do *[sic]* all the things that will interest me… You know I plays *[sic]* a little golf and my buddies, some of them use the computer for information and so on, so I guess I will be able to do all the things they talks *[sic]* about.

C.D. Participant's statement regarding his intentions to use the computer with efficiency comparable to his daughter, grandchildren and friends was indicative of the

strength of the associations he was able to make between the computer and the outcomes others have realized from use of it. Making the connection between his evaluations of the usefulness of the computer and the potential to achieve similar outcomes from his usage gave him a positive disposition toward the technology and a concomitant favorable attitude towards computers.

Need for self-efficacy. This study's finding of the need for self-efficacy was consistent with the research base in this area of inquiry. As Chaffin and Harlow (2005) observed, "…communicating about one's needs and maintaining one's autonomy can be enhanced if older adults learn and use computer skills" (p. 301). Though Purdie and Boulton-Lewis (2003) examined the learning needs of older adults and found that learning about computer technology was a low priority for older adults they also cited research, which suggested that the lower-end rating of technology may be an ego defense mechanism that lessens the threat of low competence in technologically related activities.

Generally, older adults are considered unwilling to use computers and averse to learning how to use them (Mayhorn et al., 2004). However, a positive interaction or a positive previous experience is important in building positive attitudes toward computers. Also, perceptions of the usefulness of computers increase with usage (Czaja & Sharit, 1998). This finding was supported by the research finding that computer self-efficacy predicts future behavior with computers, and that individuals were likely to participate in behaviors in which they believe that they will succeed rather than those that they believe would lead to failure (Kelley et al., 1999).

The finding of self-efficacy also supported the theory of andragogy – a "model of assumptions about learners" (Knowles, 1980, p. 43) and the freedom of the learner to

influence the learning process. Andragogy purports that adults will seek learning that is relevant to their immediate needs and that will enable them to cope more satisfyingly with real-life tasks or problems. The theory further notes that as learners become more comfortable with the content and with the learning processes, they will move from dependency toward increasing self-directedness.

This approach predicted that people are goal-oriented beings who behave in response to beliefs and values that are directed toward achieving some end. The effect of computer self-efficacy was consistent with expectancy-value theory in which obtained gratifications inevitably strengthen beliefs in the value of the expectancies associated with the technology.

Interestingly, Czaja and Sharit (1998) also found that after the training older people perceived computers as being more useful than the other participants in their study. In an earlier study, Hoot and Hayslip (1983) observed that mastering computer skills and frequent usage are important in promoting a sense of self-efficacy in older adults and less dependence on others. Deng, Doll, and Truong (2004) found that computer self-efficacy played an important role among ongoing users and that its impact was not restricted to the early stages of interaction with the technology.

While early research found that older adults identified social interaction as a primary benefit of computer usage (Danowski & Sacks, 1980), more recent research found that older adults were more interested in learning to use the computer to gain access to information and to maintain functional independence (Mayhorn et al., 2004). This was consistent with the views shared by participants, including D.E. Participant:

> I remember thinking after the class that they needed to teach us other things before they move on to introducing the internet. There were other things that I wanted to be able to do and there are tons of things that I am sure that I still haven't learned to do. For instance, there are things that my wife can do, like a spreadsheet. Not that I have need to use a spreadsheet, but there are things that I still need to be able to do on my own.

The finding of the need for self-efficacy was consistent with findings in the literature, which suggest that it was important that the general goals of the older adult learner be understood and assimilated into training programs by addressing what older adults need to learn about computers and their reasons for desiring such skills (Mayhorn et al., 2004).

Construction of personal meaning. In their seminal study, Jay and Willis (1992) noted that attitude change can result from computer experience but the process by which the change takes place is unclear:

> The information gained about computers during training is a vital factor, but the actual content of the information and the means by which it is processed and evaluated by the individual are not known. (p. 256).

The present study contends that the construction of meaning is the process alluded to by Jay and Willis. Beginning with Mezirow and Associates' (1990) view that "No need is more fundamentally human than our need to understand the meaning of our experience" (p. 11), this study found that when given the opportunity to reflect on beliefs about computer interaction which are based on assumptions acquired through earlier learning, participants were able to determine whether those beliefs were justified under present circumstances. C.D Participant relayed this comment:

> I always used to think that women used the computer more than men because men had better things to do. Women worked all the time with the computers. First it was the typewriter and then the computer. When I worked for the county the women spent a lot of time on the computer and they were good at their work. The way I sees *[sic]* it was that that was their thing… Now I know a little something about computers and… I don't think being a man or being my age should stop you from learning the computer.

The construction of personal meaning as used in this study was related to Mezirow and Associates (1990) meaning-making process. It allowed for a reinterpretation of an old experience (or a new experience) from a new set of expectations, thus constructing a new meaning that was applied to the old experience. Meaning was making an interpretation or making sense of one's experience. Therefore, a revised interpretation guided future action, which could include the modification of one's attitude towards computers.

The process of meaning-making was influenced by meaning perspectives and their concomitant meaning schemes. Mezirow (1991) defined meaning perspective as a set of habits of expectation that constituted a frame of reference, which served as a belief system for interpreting and evaluating the meaning of experience. Meaning perspectives generated meaning schemes, which were more likely to be examined critically and transformed, and were manifestations of specific habits of expectation that guide action.

As this study began the researcher found that although older African Americans reported positive attitudes towards computers, their comments also indicated that they did not identify the technology as having any relevance to their daily living. Further probing revealed that participants' meaning schemes perceived the computer as work related equipment with little or no benefit to individuals outside of the workforce. When asked

why she had not used a computer before G.H. Participant said, “I honestly have never been interested in using a computer. What would I need it for? I don’t work anymore and I don’t have plans to work again.”

Conceivably, it may be due to this reason that Stanley (2003) found the participants in her study used technology such as cellular phones and programmable entertainment devices such as video recorders but they resisted computer adoption. Perhaps Stanley’s finding of a relationship between ethnicity, identity, and computer attitudes that significantly undermine motivation for acquiring computer skills was reflected in the view expressed by A.B. Participant:

> The problem with people my age is that we are content with the way things are. That is what makes us different from the young people. Young people are not afraid to try new things… I am looking at possibilities to do new things in retirement. Look at white folks, when they retire they remain active, they return to work or volunteer… One of my former co-workers… retired and now he works at Sears Automotive and using a computer. African Americans on the other hand seem content to retire and sit at home. Why? Probably because we don’t have the skills these employers are looking for. Knowing how to use a computer, I will be marketable.

Though the aforementioned comment by A.B. Participant reflected a revision in his meaning perspective regarding post-retirement lifestyle, it was influenced by a meaning scheme that associated the computer with the workplace. However, continuous reflection on his assumptions about the computer could result in a transformation of this particular meaning scheme. In addition to Mezirow (1990, 1991), Fisher (1998) noted the importance of reflection in learning in which insight gained from within the self was depicted as learning from within and included adjusting to changing life situations.

On the other hand, by the end of this study almost all the other respondents had experienced a revision of their perception of the computer. G. H. Participant was using the internet with assistance from her granddaughter and was accessing sites containing information on her favorite television show and its leading actors.

Perhaps it was D.E. Participant's whose might be regarded as the capstone comment on construction of meaning:

> The computer has put the entire world at my fingertips. There is no knowledge that I can't get. Science, medicine, animals, plants, whatever I want to know about, it's in there. Never in my life would I have thought that I would be interested in that kind of knowledge at my age… Everything there is to know is accessible through the computer. I have access to information that my daddy never had and to think that it will probably get even better by the time my grandson reaches college. We may not know it but the computer will change the way we learn.

This comment captured the construction of personal meaning as learning. It was obvious from the comment that the participant had previously delimited the exploration of certain knowledge to the younger learner and to technology that excluded the computer. His re-conceptualization of learning as a lifelong process and the computer as a learning technology had helped him make sense of the importance of the computer interaction experience.

Prior research could not explain the process by which beliefs and overall evaluations concerning the computing event were formed and became accessible in memory as the cognitive foundation from which attitudes were assumed to follow. This study concluded that it was a cognitive process of meaning construction in which participants reinterpreted an old experience (technophobia or vicarious computer

experience) from a new set of expectations (beliefs derived from obtained gratifications). This revised interpretation guided the modification of attitudes toward computers.

Conclusions

Several general conclusions can be drawn from the findings reported in this study. First, as a population older adult African Americans generally hold positive attitudes toward computers. However, the lack of perceived relevance of computers to daily living was the primary reason for non-usage of the technology. Physiological and other factors notwithstanding, the wider structural reasons of ambivalence and relevance are paramount in explaining the lower levels of computer usage among older adults (Selwyn, 2004). Research has begun to focus on African Americans' use of the internet to access healthcare information (Bertera et al., 2007; Birru & Steinman, 2004; Jackson et al., 2005), which is important in establishing relevance of the computer and internet access for the older adult African American population. Therefore, computer training programs designed for this population must consider the goals and learning needs desired by the participants (Mayhorn et al., 2004).

Second, older adult African Americans are interested in computers and will volunteer to acquire computer skills when offered the opportunity. Research indicated that interest in the computer was the strongest predictor of participation (Czaja & Sharit, 1998). The acquisition of computer skills, however, was not without its challenges. Research has consistently shown that when compared to younger adults, older adults encountered more difficulty in the acquisition of these skills, required more training, and achieved lower levels on performance measures such as speed due to the slowing of cognitive processes associated with aging (Czaja & Lee, 2001; Jones & Bayen, 1998).

However, training could be tailored for this population paying special attention both to cognitive processes and to levels of education in this population, which had experienced unequal educational opportunities due to segregation and racial discrimination. Some evidence suggested that older adults required specific procedural training to learn to use computer technology (Echt et al., 1998; Hickman et al., 2007; Morrell et al., 2000; Segrist, 2004). Others, including Nair, Czaja, and Sharit (2007), have realized findings with implications for computer training that included minimizing the cognitive burden of tasks as might be reflected by perceptual, memory, and response time demands. These were necessary considerations when older adult African Americans were offered computer training and would influence their attitudes toward computers.

Finally, computer training provided a transformative learning experience for older adult African Americans. Lacking any personal computer interaction experience older African Americans held beliefs about computers based upon perceived expectancies or the self-report of others. Invariably, older African Americans with no computer interaction experience would perceive the computer as work equipment delimited to the workplace or a classroom gadget that students used to "type" their work or play games.

Exposure to a computer interaction experience transformed older African Americans' meaning perspectives regarding computer usage from the acquisition of skills necessary to master a technology of the 21st century to the creation of an interactive social experience that facilitated the flow of information in real time. It was a movement from beliefs about computers to beliefs in the capability of computers, and impacted their computer attitudes.

Recommendations for Future Research

At the outset, all the participants in this study reported positive attitudes toward computers. Those in the experimental group responded favorably to the training condition and findings of the qualitative inquiry indicated a positive computer experience for these participants as well as insight into the cognitive processes involving beliefs about, or factual knowledge of computers that influence attitudes. A positive attitudinal shift was also evident in the second administration of the ATCQ indicating that the computer interaction experience produced greater favorable attitudes.

As the research base documenting older African Americans' computer experience expanded there were emerging directions for future research. First, it was established that older adult African Americans held positive attitudes towards computers. However, based on the theory of reasoned action (Fishbein & Ajzen, 1975), research was needed to determine the future computer related behaviors of this population. Research had shown that though brief training could improve computer attitude, a stronger predicator of future computer use was success at training (Kelley et al., 1999). This was consistent with research findings that indicated the importance of providing continuing training and support for older computer users (Xie, 2007).

Second, research has consistently reported that education was directly linked to computer interest and computer attitudes (DeOllos & Morris, 2004; Karavidas et al., 2005; Kelley et al., 1999). Education was important in sample selection for the present study, therefore a replication study using a population of older African Americans with lower levels of education was needed to determine if a similar computer experience would be reported. Since the present study did not consider the socio-economic

disposition of the participants, a future study might consider this variable as part of a comparison study.

Third, consistent with earlier studies that have documented the age-related effects on psychomotor abilities, specifically on mouse control, this study found that the complex tasks of clicking and double-clicking were hardships for the participants. Further studies were needed to examine the effects of manual dexterity on perceptions of successful computer usage by older African Americans.

Finally, research was needed to explore the influence of technology on the quality of life of older African Americans. In what ways would the use of computers and internet technology improve the lives of older adult African Americans? There were several specific areas that might be addressed:

1. The older adult population tended to be consumers of news and relied on the newspaper, radio, and television as sources of information (Hilt & Lipschultz, 2004). Access to the online media provided an immediate source of up-to-date information. Therefore, how important is the news media to older African Americans, and are they interested in the availability of online media?

2. This study has already reported on the expanding use of the internet as a source of health information for older African Americans. However, the inability of many older African Americans to access quality health care and health information has been documented (Bertera et al., 2007; Birru & Steinman, 2004; Jackson et al., 2005). With effective patient education being an essential component of patient health promotion and disease management programs, computerized patient education applications can be effective at synthesizing information into knowledge (Belda, 2004). Further, Belda has

noted that with the ubiquity of the Internet, approximately 93 million Americans were already using that medium to access health related information. Bertera et al. (2007) have established that economically disadvantaged minority seniors without prior computer experience were willing and able to learn to access and use websites that provided health information. Therefore, additional studies using a similar population should continue to examine how receptive older African Americans would be to the computer as a facilitator of health information to include health education?

3. The participants in the present study were retired and a few of them were engaged in self-employment on a part time basis. This population seemed to have had fewer responsibilities and may have found it convenient to participate and appreciate the computer interaction experience due to less cognitive load. Mehrotra (2003) noted that retirement deprives individuals of social and mental stimulation but that individuals with jobs that demand more problem solving skills do not exhibit such losses in mental function. Further research is needed to determine whether older African Americans with a heavier cognitive load caused by full time employment or full time care-giving responsibilities for grandchildren or a significant other, would perform similarly in the computer interaction experience. In other words, what is the effect of cognitive load on the computer interaction experience?

4. Several research reports have indicated the importance of the computer and the email in providing an important social and community network for older adults (Danowski & Sacks, 1980; Hilt & Lipschultz, 2004; White & Weatherall, 2000). However, being a group that places much emphasis on face-to-face contact and the

extended family, do older African Americans perceive the value of the computer as a medium to connect with significant others?

5. Spirituality is significant to the lifestyle of older African Americans. Additional research is needed to determine the correlation, if any, between spirituality and the perception of success in the computer interaction experience.

Contribution to the Field of Educational Leadership

This study contributed to the practice of adult education in schools, business, and industry where computer technology was bridging the gap between educational disparities in race, income, and age by opening channels of communication both in contiguous learning contexts and across distance while providing access to information resources.

Implications for educational leaders in adult education may be drawn from this study specifically as it relates to the issue of racial/ethnic diversity in the study of older adults and technology. The difficulties in understanding the motivation for adults to participate in formal education have been documented. Merriam and Caffarella (1999) reviewed the participation research and concluded that given the number of variables, a comprehensive theory might not be possible.

However, demographic variables have proved to be the most consistent predictors of participation. Fisher (1986) found that older participants are primarily white and female, with income and educational levels higher than non-participants. Consistent with these findings that identified the correlation between demographics and participation, Mehrotra (2003) found that the amount of formal schooling had more influence than any

other variable on participation in educational activities, and that the more education an individual had, the more interested that person would be in further education.

Because the older African American cohorts used in the present study, and succeeding cohorts with more education, are more likely than previous generations to be literate with higher levels of education, their learning needs and attitude towards computers would be important considerations when determining their participation in adult education.

Mehrotra (2003) observed that most instruction for older people is designed to transmit substantive content (pedagogy) rather than the examination of learning processes and the promotion of the development of learning skills (andragogy). Further, educators seeking to develop self-direction in older learners must introduce learners to "learning approaches that may be useful in numerous settings" (p. 653). This is linked directly to one of the assumptions of andragogy concerning the readiness of individuals to learn something when they experience the need to learn it in order to cope more satisfyingly with real-life tasks or problems (Knowles, 1980).

The progression from dependency towards increasing self-directedness, and the learner's perception of education as a process of developing increased competence to realize their full potential are also assumptions of andragogy that are congruent with steps that may move older African American learners toward self-direction in their computer interaction experience. These steps involve: (1) Begin with the participant's level of confidence and comfort, and (2) Acknowledge success at each step with encouragement and positive reinforcement (Mehrotra, 2003, p. 651).

Therefore the findings this study would be important to educational leadership and facilitators of learning in adult education settings.

Summary of the Study

The purpose of this study was to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers. The following research questions guided the study:

1. Does attitude towards computers differ for older adult African Americans who receive computer training, and those who do not?
2. Is there a distinction in computer attitudes between older adult males and older adult females in the African American population?
3. Is there an interaction effect on computer attitudes as moderated by training and gender?
4. What is the computer interaction experience of older African Americans?

The study utilized a mixed methods research design that included an experimental design and an inductive approach using interviews, and from which the following findings emerged: (a) attitudes differed for older African Americans who received computer training and those who did not, (b) there was no distinction in computer attitude between older adult males and older adult females in the African American population, (c) there was no interaction effect on computer attitudes as moderated by training and gender, (d) older African Americans exhibited a positive disposition towards computers which elicited a positive attitude towards the technology, (e) older African Americans had a nascent need for computer self-efficacy, and (f) older African Americans

constructed new meaning regarding computers as a result of their reflection on their computer interaction experience.

Based on the data presented the study reached the following conclusions:

1. Older adult African Americans generally hold positive attitudes toward computers but the lack of perceived relevance of computers to daily living was the primary reason for non-usage of the technology. Therefore, computer training programs designed for this population must consider the goals and learning needs desired by this population.

2. Older adult African Americans are interested in computers and will volunteer to acquire computer skills when offered the opportunity. Training should be tailored, paying attention both to cognitive processes related to aging and to levels of education in this population, which has experienced unequal educational opportunities due to segregation and racial discrimination.

3. Computer training provided a transformative learning experience for older adult African Americans. The computer interaction experience transformed their meaning perspectives regarding computer usage from the acquisition of skills for operating the system to the creation of an interactive social experience that facilitated the flow of information in real time.

The findings that have emerged from the data gathered for this study and the conclusions that have been reached are a first step in elucidating the computer interaction experience of older adult African Americans who have been underrepresented in the literature. The data provided the basis from which determinations should be made regarding older African Americans continued use of the technology–through the

availability of continued training and in identifying technology's influence on their quality of life.

These findings have also established that like the predominantly Caucasian older adults used in similar studies older adult African Americans are capable of learning to use computers and their attitudes can be influenced by direct computer experience. Contrary to Stanley (2003) this study did not find a relationship between ethnicity and computer attitudes that undermined the motivation for acquiring computer skills. Meanwhile, these findings have extended prior research by identifying the process by which attitude change takes place.

APPENDIX A

Advertising Flyer

Looking for African Americans 60 years or older who would like to participate in a study on the use of computers.

Persons interested in participating in the study should not have experience using a computer

Participants will be asked to complete a 10-minute survey at the beginning and at the end of the study.

Those who are selected may also be asked to participate in interviews.

If you are interested please call Nigel Lovell-Martin
(305) 621-6611

APPENDIX B

Demographic Questionnaire

Demographic Questionnaire

Please provide the following demographic information. The information is being collected anonymously and will not be disclosed in any way to identify any particular individual.

1. Level of education completed (√) one: High ( ); Some technical/vocational ( ) ____ years; Technical/Vocational ( ) ____ years; Some College ( ) ____ years; College ( ); Graduate education ( ) ____ years; Other (specify) _____.

2. Were you born 1915 – 1942? Yes ( ) or No ( )

3. In which age category are you: 64 – 74 ( ) or 75 – 84 ( ) or 85+ ( )?

4. Are you of African descent? Yes ( ) No ( )

5. Were you educated in elementary, junior and/or high school in the USA between 1930 and 1963? Yes ( ) or No ( )

6. Gender: Male ( ) Female ( )

7. Have you ever used a computer? Yes ( ) or No ( ). If Yes, how frequently: Once ( ), Two to Five times ( ), Six times or more ( )
Explain the purpose of your use of the computer

_____

_____

_____

APPENDIX C

Consent Form

CONSENT FORM

1. **Title of the Research Study:** Attitudinal study of older adult African Americans' interaction with computers.

2. **Investigator:** Mr. Nigel Lovell-Martin, Dr. Valerie Bryan – Dissertation Chair

3. **Purpose:** The purpose of this study is to explore the impact of the computer interaction experience on the attitudes of older adult African Americans toward computers.

4. **Procedures: Mixed Methods**
   Interviews – This phase will involve three structured interviews composed of open-ended questions, some with probing questions. Interviews will last approximately 15 minutes. There will be two weeks between interviews.
   If selected for the interviews, will you agree to be tape-recorded? Yes or No
   Experiment – This phase will involve assignment to one of two groups (experimental or control) and the completion of a 15-item questionnaire pre and post experiment. The experimental group will receive computer training as part of the study. The control group will receive similar training as a benefit of participation.

5. **Risks:** There is a risk of frustration for participants who have never used a computer. This risk will be offset by the use of a mentor who will give individual attention to any affected participants. Other risks involved with participation in this study are no more than one would experience in regular daily activities.

6. **Benefits:** Participants in the study will receive computers training at no cost to them, while the potential benefit is the contribution to be made to understanding the impact that computers are having on the older African Americans.

7. **Data Collection & Storage:** All information gathered for this research will be kept confidential and secured. Only people working with this study will have access to data, unless required by law. On completion of the project all stored data will be destroyed.

8. **Contact Information:** For related problems or questions regarding your rights as a participant, contact the Office of Sponsored Research of Florida Atlantic University at (561) 297-2310. For other questions about the study, call the principal investigator Nigel Lovell-Martin at (954) 442-3123 or Dr. Valerie Bryan at (561) 799-8639.

9. **Consent Statement:** I have read or had read to me the preceding information describing this study. All my questions have been answered to my satisfaction. I am 18 years of age or older and freely consent to participate. I understand that I am free to withdraw from the study at anytime. I have received a copy of this consent form.

   Signature of Participant: _____ Date _____

   Signature of Investigator: _____Date _____

APPENDIX D

Computer Course

Introduction to Computers: Working with the Mouse, Keyboard and the Internet

LEARNING OBJECTIVES:

The specific learning objective of this course is to prepare older adults to use the mouse, keyboard and scroll-bar well enough to navigate the Internet.

As a result of this class learners will become aware that older adults are using computers in huge numbers. They will be assured that anyone can learn the skills necessary to use a computer. Learners will come away from this course with skills that will enable them to use the mouse and keyboard, as well as being able to navigate the Internet including the use of electronic mail (e-mail).

SESSION I

Topics:

- **Overview and Introductions**

(Learners will introduce themselves and tell why they volunteered to take the course).

- **What are Computers?**

(Attention will be focused primarily on the external hardware and is not intended to discuss the internal parts of the Central Processing Unit. Learners will be introduced to the hardware components, namely, monitor, base unit, diskette drive, CD-ROM drive, keyboard and mouse. Learners will also be taught how to turn on the computer).

- **Computer Vocabulary**

Learners will be introduced to terms such as Input devices, Output devices, Memory, and Storage Devices that are used to identify some of the external hardware used under the previous heading. Other terms will include the World Wide Web, E-mail, and Internet.

- **How to Use the Mouse**

The instructor will facilitate a demonstration on how to hold the mouse. The use a flip chart if possible for diagramming will be used. The demonstration will include moving the mouse to point, single clicking without moving the mouse, moving the mouse and single-clicking, right clicking, double-clicking without moving the mouse, moving the mouse and double-clicking. The Learners will also be taught how to use the mouse to drag an object on the monitor. Learners will be taught how to use the mouse to go to START, PROGRAMS, and ACCESSORIES. The learners will be introduced to the card game “Solitaire” to reinforce the pointing, clicking and dragging skills.

Turning off the Computer – Learners will be shown how to correctly exit the program and shut down the computer.

Question and Answer Session

SESSION II

Topics:

- **Using the Keyboard**

This session will use Microsoft Word. Mouse skills will be utilized to go to START, PROGRAMS, ACCESSORIES, and start the Microsoft Word program. The instructor will spend time demonstrating how to type into the computer. Learners will be guided on how to change the default text size from 12 to 18 or 20 for this exercise.

- **The Most Important Keys**

Attention will be given to the SPACE BAR, ENTER, SHIFT, CAPS LOCK, BACKSPACE, DELETE and the ARROW KEYS. At this stage no consideration will be given to the F keys, Control, Alt, Delete, or any "keyboard commands."

- **Saving and Deleting**

The instructor will demonstrate how learners can “save” the work they have created as a document to the desktop and use the mouse to double-click and open the saved document. The instructor will conclude this exercise by demonstrating how to delete documents that have been created.

Question and Answer Session

SESSION III

Topic:

- **Surfing The Web**

This session will demonstrate how to use the mouse to double-click on the Internet Explorer icon to gain access to the Worldwide Web and using the default Yahoo Search engine. Learners will be encouraged to initiate their own searches based on their individual interest. Peer-assistance will be encouraged. The instructor will demonstrate how to set up a free email account. Learners will be encouraged to set up an account with an easy-to-remember username and password.

Question and Answer Session

SESSION IV
Topic:

- **Communicating Electronically – "You've Got Mail"**

The instructor will send a congratulatory email to all the learners prior to the beginning of this session. Learners will be instructed to access their email user their username and password used to set up their accounts. The instructor will demonstrate how to reply to an email, using the email participants received. Learners will also be taught how to compose a message. Each learner will be placed in a group of either 3 or 4 learners and they will exchange email addresses so that they can communicate with each other electronically during the session.

Question and Answer Session

Evaluation

APPENDIX E

Attitudes Toward Computers Questionnaire (ATCQ)

ATTITUDES TOWARD COMPUTERS QUESTIONNAIRE (ATCQ)

This questionnaire examines your attitudes toward computers. There is no "right" or "wrong" answer. Read each item carefully and circle the answer that corresponds best to your opinion. Please answer ALL items.

1. I feel comfortable with computers.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

2. Learning about computers is a worthwhile and necessary subject.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

3. Reading or hearing about computers would be (is) boring.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

4. I know that if I worked hard to learn about computers, I could do well.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

5. Computers make me nervous.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

6. I don't care to know more about computers.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

7. Computers would be (are) fun to use.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

8. I don't feel confident about my ability to use a computer.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

9. Computers are <u>not</u> too complicated for me to understand.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

10. I think I am the kind of person who would learn to use a computer well.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

11. I think I am capable of learning to use a computer.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

12. Learning about computers is a waste of time.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

13. Computers are confusing.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

14. Computers make me feel dumb.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

15. Given a little time and training, I know I could learn to use a computer.

1	2	3	4	5
Strongly agree	Agree	Neither agree/disagree	Disagree	Disagree strongly

Note: Scoring on the following items is reversed: 1, 2, 4, 7, 9, 10, 11, and 15.

Item loadings on specific dimensions are as follows:
Comfort: 1, 5, 8, 13, 14.
Efficacy: 4, 9, 10, 11, 15.
Interest: 2, 3, 6, 7, 12.

Used with permission.

Jay, G. M., & Willis, S. L. (1992). Influence of direct computer experience on older adults' attitudes toward computers. *Journal of Gerontology: PSYCHOLOGICAL SCIENCES, 47,* 250-257.

APPENDIX F

Interview Protocol

Interview Protocol

I am Nigel Lovell-Martin and I would like to thank you for meeting with me. Please allow me to share with you what this is about and then ask if I can record our conversation. I will need your permission to do this on tape so I will repeat the information once I receive your permission to record it. *(If permission is given the tape will be turned on).*

This is a dissertation research project on the computer interaction experience of older adult African Americans and its effect on their attitudes toward computers. In this phase, which will use only interviews, I am seeking a descriptive response to the question: *What is the computer interaction experience for older adult African Americans?*

I will need your consent to do this interview at this time. Do you wish to read or should I read the consent form to you? *(When the form is read the interview will continue).* Do you agree to participate in this interview and sign the consent form? Please answer yes or no.

In order to continue I would like for you to choose a pseudonym so that we can protect your identity.

The study will explore older adult African Americans' computer interaction experience and its effect on their attitudes toward computers, so in this interview we will attempt to uncover the nature of the computer experience.

First Interview

1. What aroused your interest in this project on computer usage?

a. Probe A: Why haven't you used a computer before?

b. Probe B: What do you expect to learn in this project?

c. Probe C: What are some of the fears or concerns you have about this experience?

d. Probe D: How different do you think it would have been if you were younger?

e. Probe E: Had you been a man/woman, would you have been interested sooner?

2. In what ways will exposure to computers open opportunities for you?

a. Probe A: How do you think it will change your life?

b. Probe B: If you were to explain to a person of a similar age about your decision to participate in this project what would you tell them?

c. Probe C: How would friends of your gender react if they become aware that you are learning to use the computer?

Second Interview

3. How would you describe your first experience with the computer?

a. Probe A: How did the experience affect you?

b. Probe B: What were your thoughts about using it after your first experience?

4. What thoughts connected with the experience stood out for you?

a. Probe A: Was using the computer easier than you thought it would have been?

b. Probe B: Were you looking forward to finishing or were you curious about continuing?

c. What was satisfying about the experience?

i. How did that make you feel?

d. What was dissatisfying about the experience?

i. How did that make you feel?

5. At what point did you feel that your age was affecting your ability to learn to use the computer?

a. Probe B: Tell me a little more about that.

b. Probe C: Younger people seem to "catch on" to computers, why do you think this is so?

Third Interview

6. What changes in yourself do you associate with the computer experience?

a. Probe A: How does this make you feel?

b. Probe B: How would you respond to someone who says older people have more negative attitudes toward computers than younger persons?

c. Probe D: How different do you think it would have been if you were younger?

7. How frequently do you expect to use the computer and for what purpose?

a. Probe A: How much will this change the way you communicate with others?

b. Probe D: What would you wish you could do with the computer that you have not yet done?

8. Has exposure to computers opened other opportunities for you?
a. Probe A: How has your life changed?
b. Probe B: Is this something older adult females/males should be doing?
c. Probe B: If you were to explain to a person of a similar age about your experience with the computer what would you tell them?

9. Have you shared all that is significant about your experience with the computer?

"Pseudonym" I would like to thank you for your time and your participation in this interview. I will be transcribing the content on the tape at a later date and I will have you read it so that we can determine whether your views were adequately expressed.

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