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Performance of older people at different levels of task complexity

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PERFORMANCE OF OLDER PEOPLE AT DIFFERENT LEVELS OF TASK COMPLEXITY

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ABSTRACT

Technological innovations and career changes have made the workers' need for training/retraining an important issue in organizations. However, due to presumed age differences in the ability to benefit from training, employers are sometimes concerned about spending money on training for older workers. Therefore it is essential to know whether the observed differences are due to age-related decline in ability or to other factors. This study investigated the relationship of age with attitudes about computer training (self-efficacy and anxiety) and training performance at different levels of task complexity. Four hypotheses were proposed in this study: (1) Trainees' attitudes towards training (self-efficacy and anxiety) would moderate the relationship between age and training performance; (2) Self-efficacy would positively correlate with performance; (3) Anxiety would negatively correlate with performance; and (4) There would be an interaction of age and task complexity in training performance. The results found support for some of the hypotheses proposed. Trainees' attitudes towards training (self-efficacy and anxiety) moderated the relationship between age and performance. Also, trainees' self-efficacy correlated positively and anxiety correlated negatively with their performance. The fourth hypotheses was not supported. The results found no significant interaction effect of age and task complexity on performance. Implications and further research are discussed.

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CHAPTER ONE: INTRODUCTION

The current labor force is comprised of a large number of middle-aged and older workers. In the 1950s, people aged 65 or older represented 10 percent of the population, whereas in the 1990s, the percentage of people aged 65 or above went up to 15 (Forteza & Prieto, 1994). A growing number of people now in middle age want to work into their seventies and beyond (Sterns & Doverspike, 1989). The Age Discrimination in Employment Act (1967, 1978, & 1986) defines the older workers as individuals over the age of 40. Thus a major portion of the labor force falls into this category. One of the reasons for such a growing population of older workers is that more people live to older ages. Improved standards of living, working conditions, and medical advances have increased the number of older people willing and able to work. Another reason for this aging population is the baby-boom and the following baby-bust. The baby-boomers' progression towards middle age, the young people's preference for delayed parenthood, and the preference of smaller family size is leading to a comparatively older labor market (Warr, 1994). For these reasons it is important to understand how work associated variables are related to age. The current study proposes to examine the relationship of age to attitudes about computer training and training performance.

The growing number of older people in the work force and the acceleration of technological innovations have made training an important issue for employees. Employees need to adapt to new technologies and new methods of working. Due to technological innovations, the human labor force needs to be more proficient with computers. Workers are required to continually acquire new knowledge and skills. Some of the knowledge and skills may become obsolete after only a few years. For example, it is estimated that approximately half of what has been learned in school is obsolete five years after graduation (Goldstein, 1993). So training is essential for all workers.

Besides technological innovations, another factor that contributes to the need for training in an organization is career change. One of the reasons for career change is technological innovations that make skills obsolete. Many workers are not comfortable with changing to new technology. This may lead them to search for new work opportunities. Yet, they still need to be retrained to compete in the changing job market. In addition, some jobs have age limits. By the time many people reach that age limit, they have to look for other jobs. People may also change their career because the previous career was not challenging.

Therefore, both younger and older workers require training or retraining to update their knowledge and skills. Workers' needs for training or retraining are an important issue in an organization. It is typically more cost effective for an organization to train or retrain older workers rather than hire new or younger workers who will probably also need training or retraining after a few years. In addition to that, it would be an illegal practice for the employer to seek younger people. Presumed age differences in the ability to benefit from training may concern the employer with regard to spending money on training older workers. Therefore, it is essential to understand whether there are differences observed in training performance due to age related decline in ability, and if these differences can be accounted for by other factors (e.g., attitudinal factors). The present study tries to understand the mechanism behind the possible differences found in performance of older and younger workers.

The objective of the present study is to investigate the relationship between age and training performance at different levels of task complexity, while controlling for factors such as experience, nature of task, and training approach. Previous research has shown that trainees' attitudes towards training affect the performance. The current study will also test this hypothesis.

Definition of Older Workers

It is difficult to define “older workers”. The definition of “older worker” varies based on different points of view. Sterns and Doverspike (1989) have discussed different approaches for defining the term “older workers”. The legal approach is based on chronological age. The Age Discrimination in Employment Acts of 1967, 1978, and 1986 define older workers as individuals more than 40 years of age. Another way of defining age is the life span approach which emphasizes individual differences in aging. According to this approach, there is no specific age where one can differentiate young from old. The functional approach is a performance-based definition of age, commonly known as “functional age”. It defines older workers on the basis of decreases and increases in experience, wisdom, and judgement. The psychosocial approach is based on social perceptions of the older worker, the age typing of occupations, and the aging of knowledge, skill, and ability sets. The organizational approach defines older workers on the basis of aging of individuals in organizational roles (i.e., for how long that individual is performing his/her role in the organization). For the purpose of the present study, “older workers” will be defined on the basis of the chronological age approach. Since the focus of the present study is on change in the performance of adults as a function of change in chronological age, the latter will be used to distinguish older workers from younger workers. According to ADEA (1967, 1978, & 1986), people over 40 years of age are defined as older workers. Therefore, for this study, those over 40 years of age will be considered older workers.

Difference Between Younger and Older Workers

Research findings on the differences in performance between older and younger workers are inconsistent. While some studies show that performance in some cognitive abilities increases with age, others report performance as decreasing or remaining stable. Cunningham and Birren (1976) studied age changes in human cognitive abilities in a longitudinal study. Four hundred eighty five students were tested in 1944, and thirty two of them were retested in 1972. The subjects' average age was 19.5 years in 1944 and 46.7 in 1972. Another group of thirty-six male and thirty one female students were also tested in 1972. One standard deviation decrement was observed for the highly speeded relations factor for older individuals in both longitudinal and cross-sectional comparisons, whereas the difference observed in time lag comparison was negligible. These findings are consistent with other findings (Blum, Clarke, & Jarvik, 1968, and Botwinick & Birren, 1965) that longitudinal declines occur for highly speeded cognitive tasks. Birren (1974) argues that with age, the central nervous system slows its capacity to take in, store, and retrieve information.

Another cognitive ability that declines with age is spatial ability. Salthouse (1987) studied younger and older adults in three experiments. In two experiments he manipulated the number of required spatial integration operations, and in the third experiment, he manipulated the amount of information per operation using a mental synthesis task. The younger group consisted of 18-25 year olds while the older group consisted of 57-67 year olds. He found that older adults performed at lower levels of accuracy than did young adults in each experiment. The magnitude of differences due to age increased with each successive integration operation, but remained constant across different quantities of relevant information. The interpretation of the study was that the factor responsible for age differences in tests of spatial ability was an age-related reduction in the efficiency of executing operations responsible for accurate and stable representation of spatial information.

Cornelius and Caspi (1987) examined everyday problem-solving in adults and compared it with traditional measures of cognitive abilities. The researchers constructed an inventory to assess the everyday problem-solving of adults. Along with this everyday problem solving inventory, tests of verbal and abstract problem-solving abilities were administered to adults between the ages of twenty and seventy eight. The study indicated a modest but significant positive correlation between performance in the inventory and traditional ability test. Performance on the Everyday Problem-Solving Inventory and the verbal ability test increased with age, whereas performance on traditional problem solving tests decreased after middle-age. The authors found education to be unrelated to everyday problem solving, highly related to verbal ability, and moderately related to traditional problem solving. This study suggested that practical abilities increased from early adulthood through middle age. It supported a pluralistic conception of intelligence, i.e., intelligence is a multifaceted construct encompassing diverse abilities and skills.

Cunningham and Birren (1980) investigated the stability of the factor structure of intellectual ability across the adult life span. Army Alpha data set was obtained for ninety six males tested in 1919, 1950, and 1960. The same data set was obtained for two other groups, one in 1972 and the other in 1974. The study reported age changes in factor structure. The change was modest in the 20-50 years age range and pronounced in the 60-year-old group, but stable under variations of cohort and time. Verbal comprehension and the speeded factor showed a more intimate association with increasing age. The study suggested that different cognitive functions may be tapped by the same instrument at different ages. Therefore the authors suggested that simple quantitative comparisons of level of performance in the old and the young on speeded cognitive tasks may be inappropriate.

Another type of ability that is affected by aging is fluid ability as opposed to crystallized ability. Fluid ability is defined as the ability to discriminate and perceive relations and crystallized ability is defined as the habits or knowledge acquired through the past operation of one's fluid abilities (Cattell, 1972). In a relatively older study, Horn and Cattell (1967) collected data indicating that across the adult years fluid ability decreases and crystallized ability generally remained stable.

In terms of memory of older adults, different types of memory are affected differently by aging. Research has shown that primary memory (memory for events currently in consciousness) is not affected by aging, while secondary memory (memory for events that have already occurred) declines with age (Craik, 1977; Poon, 1985). Researchers have given several reasons for this decline. Sugar and McDowd (1992) suggested two explanations for the age-related differences in memory and learning performance: endogenous and exogenous factors. Some examples of endogenous factors include processing speed and ability to inhibit irrelevant information. For example, Salthouse (1985) argued that reduction in processing speed was responsible for decline in memory. Another reason proposed by Hasher and Zacks (1988) states that the reduction in ability to inhibit irrelevant information is responsible for this decline in memory. Exogenous factors that have been suggested as possible causes include differences in education, lifestyle, and personality variables (Schaie, 1983). Another example of exogenous factors include the unfamiliarity of the older people with the lab tasks and settings (Labouvie - Vief & Schell, 1982).

With regard to other types of memory, Hultsch and Dixon (1990) reported that episodic tasks typically show decline, whereas semantic tasks do not. They also found that age differences are pronounced in explicit memory tasks and attenuated on implicit memory tasks. Explicit memory is defined as memory that involves an intention to remember, whereas implicit memory is defined as memory that does not involve a conscious recollection of remembering. In another study, Light and Anderson (1985) found age differences in favor of the younger age group in tasks involving working memory. Tasks that involved working memory required simultaneous storage of recently presented material and processing of additional information. Hultsch and Dixon (1990) concluded that when experience matches the tasks, attenuation of age differences is expected. This implied that when the nature of the task is similar to the individuals' experience, they can perform better regardless of age. Therefore the nature of task and experience are important in the learning of older adults in organizational settings.

In contrast to the above findings, several studies have failed to find a relationship between age and performance. For example, Waldman and Avolio (1986) conducted a meta-analysis on thirteen published studies that examined the relationship between age and job performance. These thirteen studies contained thirty seven samples from a broad spectrum of organizations. Samples were classified into three categories according to the types of performance measures used: supervisory ratings, peer ratings, and individual productivity. The study did not find support for a decrease in performance in old age. The productivity measure showed an increase in performance in old age. But the supervisory ratings showed a decline in performance. The researchers thought that this might be due to raters' biases. They found moderating effects of job type (professional vs. nonprofessional), i.e., ratings showed better positive relations with age for professionals as compared to nonprofessionals.

In another study, Giniger, Dispenzieri, and Eisenberg (1983) found experience, not age, to be the determinant of performance. They studied the relationship of age and experience with productivity, absenteeism, accident, and turnover among 667 garment workers. They used two job categories: jobs requiring skill and speed. They found that the older group performed better than the younger group in both the categories. They concluded that it was experience that determined performance, not age.

The lack of a negative relationship between age and performance was also supported by McEvoy and Cascio (1989). They conducted a meta-analysis using data from 96 studies on age-performance correlation. They found little evidence of type of performance measure (ratings vs. productivity measures) and no evidence of type of job (professional vs. nonprofessional) moderating the relationship between age and performance. The analysis revealed that age and performance are generally unrelated.

Another support for the unrelatedness of age and performance came from the study by Avolio, Waldman, and McDaniel (1990). They found experience to be a better predictor of performance than age. However, unlike the results found in McEvoy and Cascio's (1989) meta-analysis, they found the moderating effect of the occupational type.

One important point observed by researchers related to older workers is the discrepancy in their performance in field versus laboratory settings (Salthouse, 1990). Kubeck, Delp, Haslett, and McDaniel (1996) conducted a meta-analysis to study the degree of relationship between age and training outcomes. They found poor training performance for older workers. However, the age differences were larger for laboratory samples than field samples. The findings suggested that some other factors besides age affect the performance of older people.

The review of research on cognitive aging suggests that one of the factors that influences the variations found in research findings is the type of task used (e.g., tasks using fluid ability vs. crystallized ability, primary memory vs. secondary memory, episodic tasks vs. semantic tasks, and speeded tasks vs. nonspeeded tasks). Other factors that affect the research findings are training approach, type of experience, unreliability of measurement instruments, and sample characteristics.

From these studies little can be concluded about the effect of age on work performance. With increasing age, the learning capacity for some cognitive abilities declines, while ability to utilize factors already achieved is still at its maximum. During the adult years, the capacity to develop new patterns of response (Type A or fluid ability) declines, whereas the functioning of those patterns already developed (Type B or crystallized ability) remains stable (Horn & Cattell, 1967). When the task involves speed, the performance of the older adults declines for highly speeded tasks, in comparison to the nonspeeded tasks (Cunningham & Birren, 1976; Blum et al., 1968; Botwinick & Birren, 1965). Another ability that declines with age is spatial ability (Salthouse, 1987). In terms of memory, different types of memory are affected differently by aging. Working memory declines at older age (Light & Anderson, 1985). Primary memory is not affected, whereas secondary memory declines with age (Craik, 1977; Poon, 1985). Tasks involving episodic memory show a decline in performance among older adults, whereas those involving semantic memory do not (Hultsch & Dixon, 1990). Performance declines in explicit memory tasks but is not affected in implicit memory tasks (Hultsch & Dixon, 1990). Therefore it can be concluded that one of the major determinants of performance among older adults is the task content or the nature of the task. Tasks that involve fluid ability, high speed, spatial ability, secondary memory, episodic memory, explicit memory, and working memory, show decline in performance, whereas tasks that involve crystallized ability, low speed, primary memory, semantic memory, and implicit memory, remain relatively stable with age.

Reasons for Cognitive Decline

Researchers have proposed different hypotheses for cognitive decline. These hypotheses have a moderate amount of support. One of the hypotheses is the "speed hypothesis". This theory claims that age-related differences are the result of age-related reductions in speed of peripheral sensory or motor processes. This view was supported by Salthouse (1985). However, some other researchers have found inconsistent results. The age trend was still found when the time limit was not a factor (Heron & Chown, 1967; Salthouse et al., 1988). Thus it appears that the speed hypothesis does not explain the phenomenon of decline in performance with aging in every situation.

Another hypothesis for explaining cognitive decline is the "disuse theory". This theory attributes the cause to the lack of recent exercise of the abilities. However studies have not found support for this hypothesis. For example, one of the expectations of the disuse hypothesis is that there should be minimal age-related decline in activities which are continuously performed throughout life, because no disuse has occurred that could have caused the decline. However, Randt, Brown, and Osbern (1980) did not find support for this hypothesis. Although people frequently try to repeat recently heard stories, the authors found age-related decline in recall of a story both immediately after the presentation of the story, and after twenty four hours. In another study, Wood and Pratt (1987) found that young adults performed better than the older adults in remembering familiar sayings, although older people are more often exposed to familiar sayings than younger people in their lifetime. These studies imply that there is no definitive evidence that supports the disuse theory.

The other major theory of cognitive decline is the "changing-environment hypothesis." This theory asserts that the age-related change in cognitive ability is due to the changing physical or social environment. For example, it is possible that changes in social or cultural environment may have led to higher performance on many cognitive tests. One area of evidence that can support this hypothesis is time lag analysis. If this hypothesis is true, then a time lag analysis would show that people of the same age, taking the same test recently should score higher than people who took the test earlier. However support for this hypothesis is mixed. Schaie (1983) found similar age trends in cognitive performance for subjects tested in 1956, 1963, 1970, and 1971. All of the groups tested showed similar mean levels and patterns across age. Such evidence does not support the hypothesis. However, another study by Parker (1986) supported this hypothesis. The study found that the mean performances on some intellectual tasks appear to have increased across successive generations.

Two other perspectives that Salthouse (1989) thinks can help to explain cognitive decline are componential analysis and the influence of health status. The componential analysis perspective involves an analysis of cognitive activities in terms of their hypothesized elementary components. For example, a study on the aspects of information processing required in a given cognitive task can explain the age-related decline. The health status perspective attributes the cognitive decline to the health or disease factor, because many diseases, which are more observed in older age, affect cognitive functioning.

Training

Differences in performance based on age can be important to the design of workplace training. Training is defined as the systematic acquisition of skills, rules, concepts, or attitudes that result in improved performance in another environment (Goldstein, 1993; p. 3). Training/retraining is important for both younger and older workers to improve their performance and adapt to changes in the nature of work. Retraining is important because unless the knowledge is updated, it will become obsolete. Training and development activities lead to changes in skill, knowledge, attitude, and social behavior (Cascio, 1982). Training/retraining is an important human resource management strategy for overcoming obsolescence, and preparing workers to meet future job requirements (Gist, Rosen, & Schwoerer, 1988). The importance of training to deal with technological change has been recognized by various researchers (Dooling & Klemmer, 1982; Goldstein, 1982; Nickerson, 1982; Stern & Patchett, 1984; Wexley, 1984). Goldstein (1982) mentioned that high technology will lead to change in job requirements. To perform the changed job functions, instructional programs will be necessary to train the individuals. Also, the development of new technology can result in the designing of new training methodologies and techniques. Researchers have challenged James's (1890) assertion that "outside of their own business, the ideas gained by men before they are twenty-five are practically the only ideas they shall have in their lives. They cannot get anything new" (as cited in Salthouse, 1989). The research shows that successful training can occur in older adults. However, to have an effective training program for older workers, it is essential to know what is responsible for the difference in performance between older and younger workers: decline in ability or some other factors? Training time is an important issue in any workplace training. Researchers agree that on average older workers require a longer time to reach proficiency than younger workers (Elias, Elias, Robbins, & Gage, 1987; Valasek, 1988). Forteza and Prieto (1994) reported that elderly people take almost twice as long as the younger people to learn a series of associated pairs, but once learned they remember them as well as the younger people do.

To study the age difference in training time, Hartley,

Hartley, and Johnson (1984) used word processing training with older (65-75) and younger (18-30) subjects. They found that after twelve hours of instruction there was no difference between older and younger workers in accuracy. However, older adults required longer time to select and carry out the appropriate procedures. They also required more assistance while carrying out editing tasks. The researchers concluded that the older adults were slower in using information and were less effective than the younger adults. Belbin and Belbin (1972) concluded that older workers may need slower presentation rates, longer periods to complete diagnostic tests, and longer periods of study.

<u>Moderators</u>

The inconsistency in past research investigating the relationship between age and performance may be due to other factors that moderate the relationship.

Attitude towards training: Studies have reported that one of the important component in the success of a training program is the attitude of trainees towards training. According to Sanders and Yanouzas (1983), trainees enter the learning environment with certain attitude and expectations and these may or may not be helpful in the learning process. Trainees with positive expectations are more likely to be ready for training.

Understanding trainees' attitude is critical, regardless of their age. The desire to participate and learn is important for all trainees. But the older trainees' desire may be masked by a fear of failure or the fear of inability to compete against younger trainees (Sterns, 1986). Camp (1942) studied two professors, aged 35 and 72 years. The researcher discussed with both of them an incident which all three of them had witnessed together. A month later he checked the memories of the two men in a casual conversation. There was no significant difference between the two. The same procedure was repeated by substituting a novel read by all of them instead of the incident used in the first experiment. Again, there was no significant difference in the accuracy. At this point, it was explained that a learning experiment was to be undertaken. Each of them learned the same two pages of a novel. It was found that the younger man took 35 minutes to learn, but made ten errors in recall, whereas the older man required 65 minutes to learn, but made only six errors. The older man explained that he learned it much sooner but he wanted to make very sure about it. The researcher concluded that the inferiority feelings of the older man caused the deficiency in his learning time.

Researchers have pointed out that the trainees' self confidence helps them learn. This concept, labeled as *self-efficacy,* is a critical concept in Bandura's (1986) social learning theory. Self-efficacy refers to the belief in one's capability to perform a specific task (Goldstein, 1993; p.91). It is an important concept in the learning process. For example, Locke, Frederick, Lee, and Bobko (1984) found self-efficacy to be a significant predictor of future performance even when the past performance of the subjects was controlled. They also found that the self-efficacy ratings for moderate to difficult levels of performance were the best predictors of future performance. Gist, Schwoerer, and Rosen (1989), in another study, found that subjects with high computer self-efficacy performed better than those with low self-efficacy.

Pajares and Kranzler (1995) studied self-efficacy beliefs and general mental ability in mathematical problem-solving among high school students. They found that both self-efficacy and ability have strong, direct effects on performance. In another study, Moulton, Brown, and Lent (1991) conducted a meta-analysis to study the relations of self-efficacy to academic performance. They found a positive and significant relationship across a wide variety of subjects, experimental design, and assessment methods.

Studies have found that an individual's previous experience is related to his/her self-efficacy. For example, Swigert (1995) found that computer self-efficacy is positively related to computer experience.

Researchers have also tried to find age differences in self-efficacy. Rebok and Balcerak (1989) studied memory self-efficacy and performance differences in young (17-19 years) and old (60-78 years) adults. They found that the young adults performed better than the old adults and have higher self-efficacy.

Besides self-efficacy another factor that plays a role in trainees' performance is anxiety. The effect of anxiety on performance depends on the complexity of the task. Its effect is facilitatory for simple tasks but debilitating for complex tasks (Kausler, 1990). In terms of age effects in anxiety, while some studies have found a negative relationship between age and anxiety (Martin, 1984), some others have found the opposite (Whitbourne, 1976) and still others found no age effect (Mueller, Kausler, & Faherty, 1980).

In recent years the study of computer anxiety has received significant attention because of the widespread use of computers at work place. Researchers have investigated the effect of different demographic variables on computer anxiety. One such variable studied was age. However, Gilroy and Desai (1986) found no age-related differences in computer anxiety in their study. This view was supported by Charness, Schumann, and Boritz (1992). In another study, Marquie, Thon, Baracat, and Baracat (1994) found that age alone was not the most important factor affecting subjects' attitude. Subjects' qualification, use of computers, and work tasks influenced their attitude.

The above discussion suggests that in the training environment several other factors besides age determine the performance of trainees. Some of the important factors that contribute towards better performance of trainees are self-efficacy and anxiety of the trainees. Therefore understanding the attitudes of the individuals going into the training is important. In terms of age effect, differences have been found in self-efficacy. In computer anxiety, very few studies have found age effect. But such age effect can be attributed to the lack of experience. It can be apprehended that, the age effects found in performance could be due to the low self-efficacy and high anxiety, not due to age per se.

Task complexity: Another moderator that affects the relationship between age and performance is task complexity. The number of processing operations involved in a task implies the complexity of the task. The higher the number of processing operations involved in a task, the greater is the complexity of that task. Studies have shown that older adults' performance is affected by increase in the complexity of the task more than that of the younger adults (Birren, 1956; Clay, 1954). Birren, Allen, and Landau (1954) conducted a study to examine performance in simple addition of columns and digits of varying lengths. They found that the probability of correct responses by older adults dropped more rapidly compared to younger adults when the series of digits was increased. The time required changed relatively more for the younger than for the older group. But the absolute increases in time were greater for the older group. Salthouse (1992) conducted a study to investigate the causes of difference in performance among old and young adults as a result of task complexity. The subjects were 451 adults between eighteen and eighty years of age. The subjects had to attempt four cognitive tasks, i.e., reasoning, analogies, cube assembly and paper folding, each at three levels of complexity. The study supported the view that the older people's performance is affected by the task complexity. He found that the strongest predictors of performance on the intermediate and complex versions of the task were performance on the simpler version of the same tasks and a composite measure of working memory. It was concluded that one cause of the age-complexity phenomenon is that more complex cognitive tasks place greater demands on a working-memory resource that declines with increased age.

Several other factors are also thought to have a moderating effect on the age-related differences in performance. Research on moderating effects of experience shows that older workers with domain related experience can do as well as the younger workers. Salthouse and Somberg (1982) studied the effects of adult age and experience on elementary processes. They concluded that performance improves with moderate experience on simple tasks such as signal detection, reaction time, and visual discrimination. Since simple tasks are the basic elements of the complex tasks, the latter can also improve with experience. However, Avolio et al. (1990) reported that beyond a certain level, the effect of experience on job performance is plateaued. Another factor thought to have a moderating effect is the nature of the task. Studies on the effects of the nature of the task show that when the tasks involved speed, working memory, secondary memory, episodic memory, fluid ability, spatial ability, and greater attention, the older group's performance suffered (Cunningham & Birren, 1976; Horn & Cattell, 1967; Hultsch &Dixon, 1990; Light & Anderson, 1985; Salthouse, 1987; and Sugar & McDowd, 1992).

In one study, Avolio et al. (1990) broke down the jobs into five occupational types to study moderating effects of occupational type. They found that both age and experience predicted performance better for jobs requiring higher levels of complexity than other jobs. Educational level is also thought to have a moderating effect. Avolio and Waldman (1994) found educational level to be a powerful indicator of variation observed at various points in the life span. The training approach also has a moderating effect. Gist et al. (1988) studied the influence of training method and trainee age on performance during training in the acquisition of computer software skills. The behavioral modeling training method yielded better results than the nonmodeling approach. However, the younger trainees performed better than the older trainees in both the training approaches. They concluded that active participation in the learning process, discovery method, self pacing, and trainer assistance can enhance the older workers' performance.

From the above discussion, it can be concluded that there is an age-related decline in some types of cognitive abilities. However, it is likely that such declines are not strong enough to interfere with work performance. It was also concluded that the performance of older and younger adults can be improved through training/retraining. Difference in the observed training performance between older and younger workers may be due to variables other than age. The review showed self-efficacy of the trainees as an important component in the training process. Studies also have reported age-related differences in self-efficacy. Another important component of the training process is the anxiety of the trainees. However, its effect on performance depends on the complexity of the task.

The present study will examine the relationship between age and performance at different levels of task complexity. It will also study the relationship between trainees' attitude (self-efficacy and anxiety) and performance. Based on the review, it is hypothesized that:

Hypothesis 1: Trainees' attitudes towards training (self-efficacy and anxiety) will have a moderating effect on the relationship between age and training performance. When self-efficacy is high, there is no relationship between age and performance. When self-efficacy is low, there is a negative relationship between age and performance. When anxiety is low, there is no relationship between age and performance. When anxiety is high, there is a negative relationship between age and performance.

Hypothesis 2: There is a positive relationship between self-efficacy and performance.

Hypothesis 3: There is a negative relationship between anxiety and performance.

Hypothesis 4: There is an interaction of age and task complexity in training performance.

CHAPTER TWO: METHOD

Subjects

The subjects of this experiment were both male and female employees of San Bernardino and Los Angeles county. A total of 168 subjects [32 male (19%) and 136 female (81%)] participated in this study. The decision to use 168 subjects was based on Cohen's (1992) table for power analysis. According to this table, for multiple correlation, with 4 variables, medium effect size, power = .80, and α = .05, 84 subjects were required. The subjects' ages ranged from 20 to 67. There were 92 subjects (54.8%) in the younger age group (those who were 40 years old or younger) and 75 subjects (44.6%) in the older age group (those who were older than 40 years), with one subject's age missing. The total sample consisted of 18 African Americans (10.7%), 20 Asian Americans (11.9%), 48 Latin Americans (28.6%), 4 Native Americans (2.4%), 77 Whites (45.8%), and 1 other (.6%). The educational level breakdown of the sample was as follows: high school diploma, 19 (11.3%); some college, 92 (54.8%); bachelor degree, 43 (25.6%); some graduate school, 11 (6.5%); master degree, 3 (1.8%). The general computer experience of the sample ranged from no experience to 28 years of experience (M = 7.221, SD = 5.166). Subjects' spreadsheet experience ranged from no experience to 12 years of experience ($M = 2.579$, $SD = 3.113$).

Training Approach

The training was provided by the instructors of a consulting organization (Soft Train), which was hired on a contract basis by both the counties to teach computer training. The method of instruction was behavioral modeling. The instructors gave training through lecture method according to the lesson plan developed by Soft Train. The lesson plan was the same for all the training sessions in a particular subject, at a particular level. For example, there was one lesson plan for all the sessions in beginner level of Excel. During the training, subjects had access to computers to get hands-on experience.

Each training session was a one-day program. Trainees had three breaks during the training. The training was given on the beginner and intermediate level of Excel. The beginner level of Excel included learning the worksheet terminology, understanding the views, navigating in the database window, creating a worksheet, using the features, copying and moving techniques, inserting and deleting columns and rows, changing cell height and column width, formatting the worksheet, printing, and working with sheets. The intermediate level of Excel included working with functions, using range names, advanced referencing, linking work books, managing date, creating charts, and creating and running macros.

There were two levels of task complexity, i.e., simple and complex. The beginner level of Excel was considered as simple task whereas the intermediate level of Excel was considered as complex task. Learning the intermediate level of Excel involved more processing operations than the beginner level of Excel. It required more complex skill and cognitive integration of different knowledge learned in the beginner level of Excel. For example, learning to work with functions (intermediate level of Excel) required the cognitive integration of the knowledge of worksheet terminology, navigating in the database window, creating a worksheet, using the features, and formatting the worksheet. Therefore, it was considered more complex than the beginner level of Excel.

Each level of Excel was further subdivided into simple and complex tasks within training programs. In the beginner level of Excel, learning the worksheet terminology, understanding the views, navigating in the database window, inserting and deleting columns and rows, printing, and working with sheets were considered simple tasks and creating a worksheet, using the features, copying and moving techniques, changing cell height and column width, and formatting the worksheet were considered complex tasks. Likewise, in the intermediate level of Excel, working with functions, using range names, and managing date were considered simple tasks and advanced referencing, linking work books, creating charts, and creating and running macros were considered complex tasks. In both the levels of Excel, learning the complex tasks required the cognitive integration of the knowledge of the simple tasks. For the readers' convenience, hence forth, the difference in complexity between the levels will be described as "beginner level" and "intermediate level" and the difference in complexity within each level will be described as "simple task" and "complex task".

Measures

Several measures were used in this study to assess the subjects' attitudes and performance. First, the subjects were assessed on demographic variables such as gender, age, ethnicity, education, duration in the job, experience in computer and spreadsheet programs, reason for taking the training, and source of information about the training. Other measures included a Computer Self-Efficacy Scale to assess their self-efficacy on computer use, a Computer Anxiety Rating Scale to assess their computer anxiety, and a

Training Satisfaction Scale to assess their satisfaction with the training program. In addition, the subjects' performance in the training was assessed by using objective exercises, which consisted of multiple choice and true/false questions. There were two exercises for both levels (beginner and intermediate) of Excel.

The Computer Self-Efficacy Scale was a shorter, modified version of the original scale developed by Murphy, Coover, and Owen (1989). The original scale was a 32-item scale measuring three factors, beginning level, advanced level, and mainframe computer skills. However, since the focus of the current study was on training in general computer skills, some of the original items were deleted and some new items were added. The revised scale was a 19-item scale. It assessed subjects' beginning level and higher level more conceptual skills. Subjects responded to items on a 5-point Likert-type response format (1 = Strongly Disagree; 5 = Strongly Agree). To obtain the individual's self-efficacy score in computer training, the responses to the items were averaged. High scores indicated a high degree of confidence in one's ability to use computers. The alpha reliability for the scale was .97.

The Computer Anxiety Rating Scale was developed by Heinssen, Glass, and Knight (1987). It was a 19-item scale with nine positively-worded (item # 2, 4, 6, 8, 10, 12, 14, 16, and 18) and ten negatively-worded (item # 1, 3, 5, 7, 9, 11, 13, 15, 17, and 19) items. Subjects responded to items on 5-point scales (1 = Strongly Disagree; 5 = Strongly Agree). Responses to positively-worded (non-anxious) items were reversed before obtaining the total score. High scores indicated high degree of computer anxiety. The alpha reliability for the scale was .93.

The Training Satisfaction Scale was a 13-item scale prepared for the current study to measure the satisfaction of the trainees with the training. The items assessed subjects' satisfaction with adequacy of time, pace of teaching, information, applicability of the knowledge, and overall training. Four (item # 5, 7, 9, and 10) of the 13 items were negatively worded. Subjects responded to items on a 5 point Likert-type response format (1 = Strongly Disagree; 5 = Strongly Agree). Responses to negatively-worded items were reversed before obtaining the total score. High scores indicated high satisfaction with the training. The alpha reliability for the scale was .88.

There were two exercises for assessing performance, one for the beginner level of Excel and another for the intermediate level of Excel. They were developed by an Excel training instructor. These exercises were further checked by the training specialist of the county to verify whether they adequately represented the training, and to determine whether they differentiated between good and bad performers. The exercise for the beginner level of Excel included 13 true/false and 10 multiple choice questions assessing subjects' knowledge of learning the worksheet terminology (item # 9), understanding the views (item # 15), navigating in the database window (item # 4), creating a worksheet (item # 2, 12, 13, 14, 19, 21, and 23), using the features (item # 5, 16, 17, and 20), copying and moving techniques (item # 8), inserting and deleting columns and rows (item # 7), changing cell height and column width (item # 18), formatting the worksheet (item # 1, 3, and 22), printing (item # 10 and 11), and working with sheets (item # 6). The exercise for the intermediate level of Excel included 11 true/false and 10 multiple choice questions assessing subjects' knowledge of working with functions (item # 1, 2, 3,10, 12, and 14), using range names (item # 11), advanced referencing (item # 13), linking work books (item # 5), managing date (item # 15), creating charts (item # 4, 6, 16, 17, 20, and 21), and creating and running macros (item # 7, 8, 9, 18, and 19). High scores indicated better performance in the training.

Procedure

Before the training, subjects were given an envelope containing a questionnaire about demographic variables, Computer Anxiety Rating Scale and the Computer Self-Efficacy Scale. They were asked to fill out the questionnaire prior to receiving the training. This questionnaire was collected from them during the training session. Another stamped envelope with return address on it, containing training satisfaction scale and performance assessment was given to them at the training. Subjects were asked to fill these out and mail the envelope at their own convenience. To maintain confidentiality, they were instructed not to write their return address on the envelope. To make sure that both the pre-test and post-test belonged to the same person, the same number was assigned to both the pre-test (while being received) and post-test (while being given) packets. Subjects were assured of the confidentiality of any information they provided about themselves.

CHAPTER THREE: RESULTS

Descriptive statistics were examined before conducting any hypothesis test. The mean age for the 168 subjects participating in the study was 39.4, 40.36 for the beginner level and 38.43 for the intermediate level with a standard deviation of 9.75 (total), 9.86 (beginner level), and 9.6 (intermediate level). The mean of computer self-efficacy score was 3.71 (total), 3.51 (beginner level), and 3.92 (intermediate level) with a standard deviation of .86 (total), .88 (beginner level), and .79 (intermediate level). The mean of scores in Computer Anxiety Rating Scale was 1.78 (total), 1.88 (beginner level), and 1.68 (intermediate level) with a standard deviation of .61 (total), .66 (beginner level), and .54 (intermediate level). The mean score in Training Satisfaction Scale was 4.25 (total), 4.19 (beginner level), and 4.32 (intermediate level) with a standard deviation of .50 (total), .56 (beginner level), and .42 (intermediate level). The mean score in the performance quiz was 15.57 (total), 15.69 (beginner level), and 15.45 (intermediate level) with a standard deviation of 3.00 (total), 3.30 (beginner level), and 2.69 (intermediate level). The mean of spreadsheet experience was 2.58 (total), 2.04 (beginner level), and 3.14 (intermediate level) with a standard deviation of 3.11 (total), 3.10

(beginner level), and 3.04 (intermediate level). The descriptive statistics for age, Computer Self-Efficacy Scale, Computer Anxiety Rating Scale, Training Satisfaction Scale, total score for the quiz, and Spreadsheet experience are shown in Table 1.

Table 1. Measures of Central Tendency

	Beginner Level		Intermediate Level		Total Subjects	
	M	SD	M	SD	M	SD
Age	40.36	9.86	38.43	9.6	39.4	9.75
Computer Self Efficacy	3.51	.88	3.92	.79	3.71	.86
Computer Anxiety	1.88	.66	1.68	.54	1.78	.61
Training Satisfaction	4.19	.56	4.32	.42	4.25	.50
Performance Quiz	15.69	3.30	15.45	2.69	15.57	3.00
Spread Sheet Experience	2.04	3.10	3.14	3.04	2.58	3.11

To examine the normality, the histograms were compared with the normal curves. The distribution of age and scores in the performance quiz looked normal. The distribution of scores in the Computer Self-Efficacy Scale and the Training Satisfaction Scale was negatively skewed. The distribution of scores in Computer Anxiety Rating Scale was positively skewed. This level of skewness is consistent with previous literature and is not extreme enough to want adjustment.

Hypothesis 1

The first hypothesis predicted that trainees' attitudes towards training (self-efficacy and anxiety) would moderate the relationship between age and performance. Due to small sample size, the results of the regressions were aggregated across the beginner and intermediate classes. To test the hypothesis, moderated regression analyses were conducted. To examine whether self-efficacy moderates the relationship between age and performance, age and self-efficacy and then the interaction between age and self-efficacy were entered as independent variables with performance as dependent variable. The results revealed a $\underline{R}^2$ change of .014, $\underline{p} < .05$ (see Table 2), supporting the hypothesis that self-efficacy moderates the relationship between age and performance.

To examine whether anxiety moderates the relationship between age and performance, age and anxiety and then the interaction between age and anxiety were entered as independent variables with performance as dependent variable. The results showed a $\underline{R}^2$ change of .045, $\underline{p} < .05$ (see Table 2), supporting the hypothesis that anxiety moderates the relationship between age and performance.

The same analyses were also used to test the moderating effect of self-efficacy and anxiety in the relationship between age and performance, when the task was either simple or complex. The results showed that anxiety moderated the relationship between age and performance, when the tasks were both simple (R^2 change = .041, $p < .05$), and complex (R^2 change = .025, $p < .05$) (See Table 2). With regard to self-efficacy, the results revealed that, although it moderated the relationship between age and performance when the whole quiz was taken into consideration, it did not moderate the relationship, when the simple and complex tasks were analyzed separately (R^2 change = .013, $p > .05$ for simple tasks, R^2 change = .008, $p > .05$ for complex tasks) (see Table 2). Therefore, although the hypothesis that trainees' self-efficacy moderated the relationship between age and performance was supported, the small effect size must be taken into consideration.

Table 2. Change in Regression Coefficients

	Performance	R^2 Change	Sig.
Self-efficacy	Total Performance	.014	.04
	Simple Tasks (within each level)	.013	.075
	Complex Tasks (within each level)	.008	.171

	Performance	R^2 Change	Sig.
Anxiety	Total Performance	.045	.002
	Simple Tasks (within each level)	.041	.005
	Complex Tasks (within each level)	.025	.027

Hypothesis 2

The second hypothesis predicted that there was a positive relationship between self-efficacy and performance. A bivariate correlation between self-efficacy and performance indicated a significant positive correlation (r =.6715, $p < .05$) with medium effect size, supporting the hypothesis (see Table 3). Two other bivariate correlations were also conducted to analyze the relationship between self-efficacy and performance in simple tasks and self-efficacy and performance in complex tasks. The results revealed significant positive correlations (r = .5774, p < .05 for simple tasks; r = .5458, p < .05 for complex tasks) (See Table 3). The effect size was medium for both the analyses (see Table 3).

Hypothesis 3

The third hypothesis predicted that there would be a negative relationship between anxiety and performance. A bivariate correlation between anxiety and performance showed a significant negative correlation (r = - .4459, p < .05) with medium effect size, supporting the hypothesis (see Table 3). To analyze the relationship between anxiety and performance in both simple and complex tasks, bivariate correlation analyses were conducted. The results indicated significant negative correlation (r = -.3713, p < .05 for simple tasks; r = -.3682, p < .05 for complex tasks) (See Table 3). The effect size was medium for both the analyses (see Table 3).

Table 3. Pearson Product-Moment Correlation Matrix

Variable 1	Variable 2	Correlation	Effect Size (r^2)	n	p
Self-efficacy	Performance (Total)	.6715*	.4509	168	0
Self-efficacy	Performance (Simple)	.5744*	.3299	168	0
Self-efficacy	Performance (Complex)	.5458*	.2978	168	0
Self-efficacy	Age	-.149	.0222	167	.055
Self-efficacy	Spreadsheet Experience	.5084*	.2584	164	0

Variable 1	Variable 2	Correlation	Effect Size (r^2)	n	p
Self-efficacy	Training Satisfaction	.1626*	.0264	168	.035
Anxiety	Performance (Total)	-.4459*	.1988	168	0
Anxiety	Performance (Simple)	-.3713*	.1378	168	0
Anxiety	Performance (Complex)	-.3682*	.1355	168	0
Anxiety	Spreadsheet Experience	-.3220*	.1036	164	0
Anxiety	Age	.1552	.0240	167	.045
Anxiety	Training Satisfaction	-.1671*	.0279	168	.030
Age	Spreadsheet Experience	.0492	.0024	163	.533
Age	Training Satisfaction	-.0308	.0009	167	.693
Age	Performance (Total)	-.1087	.0118	167	.162
Age	Adequacy of Time	-.0338	.0011	167	.664
Training Satisfaction	Spreadsheet Experience	.2498*	.0624	164	.001

Variable 1	Variable 2	Correlation	Effect Size (r^2)	n	p
Training Satisfaction	Performance (Total)	.2105*	.0443	168	.006
Training Satisfaction	Performance (Simple)	.1523*	.0231	168	.049
Training Satisfaction	Performance (Complex)	.1869*	.0349	168	.015
Spreadsheet Experience	Performance (Total)	.3716*	.138	164	0

* correlation is significant at the .05 level

Hypothesis 4

The fourth hypothesis predicted that there was an interaction of age and task complexity in training performance. Three 2-way Analysis of Variance were used to analyze the interaction effect of age and task complexity on total performance score, the score for simple and the score for complex tasks. The results revealed no significant interaction in all cases ($F = 2.223$, $p > .05$ for total performance score, $F = .735$, $p > .05$ for simple tasks, and $F = 2.231$, $p > .05$ for complex tasks), failing to support the hypothesis (see Table 4).

Table 4. Interaction Effect of Age and Task Complexity on Performance

Interaction effect of age and task complexity (between the levels)	F	DF	Sig.
On Total Performance	2.223	1	.138
On Simple Tasks (within each level)	.735	1	.393
On Complex Tasks (within each level)	2.231	1	.137

<u>Additional Analysis:</u>

Several additional analyses were conducted to further examine the data set. The first analysis was a hierarchical regression used to analyze the effect of self-efficacy on performance above and beyond experience. The results indicated a significant effect for experience (R^2 =.145, p < .05). When self-efficacy was entered into the analysis, it predicted performance above and beyond experience (R^2 change = .309, p < .05). Likewise two other hierarchical regressions were used to analyze the relationship of self-efficacy with performance in simple and complex tasks. The results indicated a significant effect for experience (R^2 = .078, p < .05 for simple tasks; R^2 = .122, p < .05 for complex tasks). In both the analyses, when self-efficacy was entered into the analyses, it predicted performance above and beyond experience (R^2 change = .254, p < .05 for simple tasks; R^2 change = .192, p < .05 for complex tasks).

Three other hierarchical regressions were used to analyze the effect of anxiety on performance above and beyond experience. The first analysis examined the effect of anxiety on total performance above and beyond experience. The results found was significant for experience (R^2 =.145, $p < .05$). When anxiety was included in the analysis, it predicted performance above and beyond experience (R^2 change = .116, $p < .05$). The other two hierarchical regressions were used to analyze the effect of anxiety on performance in simple and complex tasks. The results found was significant for experience ($R^2 = .078$, $p < .05$ for simple tasks; $R^2 = .122$, $p < .05$ for complex tasks). In both the analyses, when anxiety was entered into the analyses, it predicted performance above and beyond experience (R^2 change = .089, $p < .05$ for simple tasks; R^2 change = .075, $p < .05$ for complex tasks).

Other additional analyses included examining the correlation of training satisfaction with age ($r = -.0308$, $p > .05$), self-efficacy ($r = .1626$, $p < .05$), anxiety ($r = -.1671$, $p < .05$), total performance ($r = .2105$, $p < .05$), performance in simple tasks ($r = .1523$, $p < .05$), and performance in complex tasks ($r = .1869$, $p < .05$) (see Table 3). The bivariate correlation between age and training satisfaction revealed no significant relationship between the two. All other correlations examined were found to be significant. However, the effect sizes were small for all the analyses (see Table 3).

A few other bivariate correlations were used to examine the relationship of spreadsheet experience with age, computer anxiety, computer self-efficacy, training satisfaction, and performance. The results revealed significant correlations of spreadsheet experience with computer anxiety ($r = -.3220$, $p < .05$), self efficacy ($r = -.5084$, $p < .05$), training satisfaction ($r = -.2498$, $p < .05$), and performance ($r = -.3716$, $p < .05$). Age was not significantly correlated with spreadsheet experience ($r = -.0492$, $p > .05$) (see Table 3).

Additional bivariate correlations analyzed the relationship of age with perceived adequacy of time, performance, anxiety, and self efficacy. The results revealed that age was not significantly correlated with any of these variables [$r = -.0338$, $p > .05$ (perceived adequacy of time); $r = -.1087$, $p > .05$ (performance); $r = .1552$, $p > .05$ (anxiety); $r = -.149$, $p > .05$ (self-efficacy)] (see Table 3). To examine gender differences in performance, computer self-efficacy, computer anxiety, training satisfaction, and spreadsheet experience, t-tests were used.

The results indicated significant differences for spreadsheet experience ($t = 2.55$, $p < .05$), with mean of 4.00 for male and 2.23 for female subjects. In all other cases, no significant gender differences were found [$t = 1.69$, $p > .05$ (performance), $t = 1.35$, $p > .05$ (computer self-efficacy), $t = -1.63$, $p > .05$ (computer anxiety), $t = .90$, $p > .05$ (training satisfaction)]. Due to small number of male subjects, caution should be exercised in interpreting the findings.

Additional t-tests were conducted to examine the age differences in computer self-efficacy, computer anxiety, training satisfaction, spreadsheet experience, total performance, performance in simple tasks and performance in complex tasks. For the purpose of analysis, age was entered as dichotomous variable. Subjects over age 40 were entered into older age group and those under age 40 were entered into younger age group. The results found no significant age difference in all cases [$t = 1.65$, $p > .05$ (computer self-efficacy), $t = -1.55$, $p > .05$ (computer anxiety), $t = .33$, $p > .05$ (training satisfaction), $t = -.40$, $p > .05$ (spreadsheet experience), $t = 1.25$, $p > .05$ (total performance), $t = .19$, $p > .05$ (performance in simple tasks), and $t = 1.49$, $p > .05$ (performance in complex tasks).

CHAPTER FOUR: DISCUSSION

The primary purpose of the study was to examine the relationship of age with attitudes about computer training and training performance. The analyses of the data set revealed support for some of the hypotheses proposed. The study revealed that trainees' attitudes towards training (self-efficacy and anxiety) moderated the relationship between age and performance. When self-efficacy was high, there was no relationship between age and performance. When self-efficacy was low, there was a negative relationship between age and performance. However, when simple and complex tasks were analyzed separately, the moderating effect of self-efficacy was not found. Such a result was revealed due to the small effect size found in the moderating effect of self-efficacy in the relationship between age and performance. The study found that self-efficacy did correlate positively with performance. These findings are consistent with previous research (Locke et al., 1984; Gist et al., 1989; Pajares & Kranzler, 1995; Moulton et al., 1991). The study also found spreadsheet experience to be positively correlated with computer self-efficacy, consistent with Swigert's (1995) findings. It was found that computer experience predicted performance. However, self-efficacy predicted performance above and beyond experience. In terms of age's relationship with self-efficacy, no significant relationship was found. This finding is at odds with the findings of Rebok and Balcerak (1989), which emphasized that younger adults have higher self-efficacy than older adults. The above results suggest that although the study did not show strong support for the moderating effect of self-efficacy in the relationship between age and performance, it acts as a major factor in determining performance of both younger and older trainees. The study also suggests that, it is not age but experience, that is correlated with self-efficacy.

The study also found moderating effects of anxiety on the relationship between age and performance. When anxiety was low, there was no relationship between age and performance. When anxiety was high, there was a negative relationship between age and performance. Furthermore, it also revealed that anxiety correlated negatively with performance. Like self-efficacy, anxiety predicted performance above and beyond experience. The results also indicated that age is not related to anxiety (replicating Mueller et al.'s (1980) findings). The above findings suggest that anxiety is another major factor in determining trainees' performance.

The fourth hypothesis expected an interaction between age and task complexity. However, the results indicated no significant interaction effect of age and task complexity on performance. It also indicated that trainees' performance differed on the basis of task complexity but not on the basis of age. These findings suggest that task complexity has similar effect on older adults' performance as it has on younger adults' performance.

The additional analyses revealed that training satisfaction had positive relationships with self-efficacy, overall quiz performance, and performance in simple and complex tasks. It implies that trainees who were more satisfied with the training had a higher self-efficacy and performed better. It was also found that training satisfaction had negative relationship with anxiety. Trainees with low anxiety were more satisfied with the training. Also trainees with more spreadsheet experience had higher satisfaction with the training, less anxiety, more self-efficacy, and better performance. The study also found gender difference in spreadsheet experience.

It can be concluded from the study that, it is not age, but other work related variables that affect the performance of trainees. These findings are consistent with some of the research findings discussed earlier (Waldman & Avolio, 1986; Giniger et al., 1983; Avolio et al., 1990; and Kubeck et al.,1996). Kubeck et al.'s (1996) findings revealed that age differences were larger for laboratory samples than field samples. It can be concluded from the findings that the factors which affect the performance of the subjects in the laboratories are not important enough to affect the performance in the actual work environment.

Implications and Recommendations

The results of the study are consistent with some of the previous findings in the literatures and at odds with some others. The study recognized that it is not trainees' age, that determines their performance. Rather it is their attitudes towards training (self-efficacy and anxiety) that affects the performance. Trainees' self-efficacy and anxiety predicted performance above and beyond experience. Trainees with high self-efficacy showed better performance than trainees with low self-efficacy. Furthermore, when self-efficacy was high, there was no relationship between age and performance and when self-efficacy was low, there was a negative relationship between age and performance. In terms of anxiety, trainees with low anxiety performed better than trainees with high anxiety. When anxiety was low, there was no relationship between age and performance. When anxiety was high, there was a negative relationship between age and performance. The result also indicated that age was not related to either self-efficacy or anxiety. The study also revealed that task complexity has similar effect on older adults' performance as it has on younger adults' performance.

Due to several limitations of the study, the results are tentative and replications are needed before conclusive generalizations can be made. One limitation of the study is the unequal representation of male and female subjects. The smaller number of male subjects limits the generalizability of the results. Also, since the data set was collected from an ongoing training program, there was no control over the content of the training program. Future researchers can plan a study, where they can design their own training programs exclusively for the experiment. This will help them control more variables. Another limitation of the study is the nature of the test used to assess trainees' performance. The trainees' performance were assessed through self-report measures, which may not be reflective of their true learning. Observation of actual performance could have been a better indicator of true learning. One more limitation of the study is the possibility of cheating by trainees. Due to time limit, trainees were asked to answer the quiz at their own convenience and return by mail. There was a chance that trainees could have referred to their books while answering the questions. Future researchers should consider all these limitations while designing their study. They can consider other factors such as experience, nature of task, educational level, and training approach along with the factors discussed above.

If these results are replicated, they can initiate collaborative efforts between training practitioners and researchers to identify new approaches to improve performance of trainees. These results can also have important implications for the employers and training coordinators. While designing a training program, they can focus more on trainees' attitudes (self-efficacy and anxiety) than on their age. By implementing techniques to enhance trainees' self-efficacy and reduce anxiety, they can improve their performance in training.

APPENDIX A: ABOUT YOU

Please circle the appropriate answer or fill in the appropriate space as carefully and accurately as possible.
General Information

1. Gender (1) Male
   (2) Female

2. Age _______

3. Ethnicity
   (1) African-American
   (2) Asian-American
   (3) Latin-American or Hispanic
   (4) Native-American
   (5) White, Caucasian, European, not Hispanic
   (6) Other (please specify) ________________

4. Education
   (1) Less than high school diploma
   (2) High school diploma
   (3) Some college
   (4) College graduate (Bachelor Degree)
   (5) Some graduate school
   (6) Master Degree
   (7) Doctoral Degree

5. How long have you been in this job? Years _______ Months _______

6. Have you ever worked with computers? Yes No
   If yes, for how long? _______

7. Have you ever worked in any spreadsheet program (e.g., Quattro Pro, Excel, Lotus etc.)? Yes No
   If yes, for how long ?________

8. Why did you decide to take the training?
   (1) Required by the county
   (2) Recommended by the supervisor
   (3) Self interest
   (4) Other reason (please specify) ____________________

9. How did you find out about this seminar? __________________

APPENDIX B: COMPUTER SELF-EFFICACY SCALE

On the scale please circle the best number that describes how you feel in regards to the statement. Please use the following scale.

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

1	2	3	4	5	I feel confident that I will learn a lot in this workshop
1	2	3	4	5	I feel confident that I will be able to apply the knowledge gained from this workshop in my current job
1	2	3	4	5	I feel confident that I will have enough time to learn everything
1	2	3	4	5	I feel confident working on a personal computer
1	2	3	4	5	I feel confident getting a spreadsheet program up and running
1	2	3	4	5	I feel confident entering and saving numbers into a file
1	2	3	4	5	I feel confident exiting from a spreadsheet program
1	2	3	4	5	I feel confident understanding terms/words relating to spreadsheet programs
1	2	3	4	5	I feel confident creating a worksheet
1	2	3	4	5	I feel confident making selections from an on screen menu
1	2	3	4	5	I feel confident using a printer to make a"hardcopy" of my work
1	2	3	4	5	I feel confident copying a disk

1	2	3	4	5	I feel confident using the different features of the spreadsheet programs
1	2	3	4	5	I feel confident adding and deleting numbers from a data file
1	2	3	4	5	I feel confident inserting and deleting columns and rows
1	2	3	4	5	I feel confident using the computer for mathematical computations
1	2	3	4	5	I feel confident formatting a worksheet
1	2	3	4	5	I feel confident moving numbers from one cell to another
1	2	3	4	5	I feel confident organizing and managing files

APPENDIX C: COMPUTER ANXIETY RATING SCALE

Read each of the following statements and respond according to how you generally feel about the idea expressed in the item. Using the following scale, circle the appropriate number for each of the phrases listed below.

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

1	2	3	4	5	I hesitate to use a computer for fear of making mistakes that I can not correct
1	2	3	4	5	The challenge of learning about computers is exciting
1	2	3	4	5	I feel apprehensive about using computers
1	2	3	4	5	I am confident that I can learn computer skills
1	2	3	4	5	I feel insecure about my ability to interpret a computer printout
1	2	3	4	5	I look forward to using a computer on my job
1	2	3	4	5	I have avoided computers because they are unfamiliar and somewhat intimidating to me
1	2	3	4	5	Learning to operate computers is like learning any new skill - the more you practice, the better you become
1	2	3	4	5	It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key
1	2	3	4	5	If given the opportunity, I would like to learn about and use computers
1	2	3	4	5	I have difficulty in understanding the technical aspects of computers

1	2	3	4	5	I am sure that with time and practice I will be as comfortable working with computers as I am in working with a typewriter
1	2	3	4	5	You have to be a genius to understand all the special keys contained on most computer terminals
1	2	3	4	5	Anyone can learn to use a computer if they are patient and motivated
1	2	3	4	5	I do not think I would be able to learn a computer programming language
1	2	3	4	5	I feel computers are necessary tools in both educational and work settings
1	2	3	4	5	I dislike working with machines that are smarter than I am
1	2	3	4	5	I feel that I will be able to keep up with the advances happening in the computer field
1	2	3	4	5	I am afraid that if I begin to use computers I will become dependent upon them and lose some of my reasoning skill

APPENDIX D: TRAINING SATISFACTION SCALE

Read each of the following statements and respond according to how you generally feel about the idea expressed in the item. Using the following scale, circle the appropriate number for each of the phrases listed below.

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

1	2	3	4	5	I am glad that I joined this workshop
1	2	3	4	5	The workshop was well organized
1	2	3	4	5	I had enough time to learn all the information
1	2	3	4	5	This workshop will help me a lot in my job
1	2	3	4	5	I was not comfortable with the pace of the class
1	2	3	4	5	I am confident that I can use the knowledge from this training at my work place
1	2	3	4	5	Attending this workshop was just a waste of time
1	2	3	4	5	I had sufficient time for questions
1	2	3	4	5	I do not see any applicability of this training in my current job
1	2	3	4	5	I felt as if I did not belong to this class
1	2	3	4	5	I am very satisfied with this training
1	2	3	4	5	I am confident that I learned a lot in this workshop
1	2	3	4	5	I would recommend this class to others

Instructions: Circle **T** if the statement is true or **F** if the statement is false.

T **F** 1. Formatting is used to change the data contents of a cell.

T **F** 2. When saving a document, Office Assistant suggests a format. Accepting the suggestions automatically saves the document to the A drive.

T **F** 3. When numbers are formatted, dollar signs and commas may be added to the numbers in a range of cells.

T **F** 4. The formatting tool bar provides access to common formatting operations such as bold face, italics, or underlining.

T **F** 5. The formula = SUM(B3:B8) can also be written as = B4+B5+ B6+ B7.

T **F** 6. Each worksheet in a workbook is identified by a tab at the bottom of the workbook.

T **F** 7. To insert cells between existing cells, hold down the Ctrl key while completing a drag-and-drop move.

T **F** 8. Cells can not be pasted to multiple ranges with one Paste command.

T **F** 9. A cell in a worksheet is formed by the intersection of a row and column.

T **F** 10. Only row levels may be printed on more than one line.

T **F** 11. Printing the file name on a worksheet is useful when the worksheet needs to be edited.

T **F** 12. A window pane is the screen on the computer monitor.

T **F** 13. To work in different sections of a large worksheet, you can freeze panes so column and row levels may be viewed at all times.

Instructions: Circle the correct response.

14. You can edit text in a cell by _____.
   A. Double-clicking the cell
   B. Clicking the cell and pressing F2
   C. Clicking the entry in the formula bar
   D. All of the above

15. Which button do you click to display Screen Tips in a dialog box?
   A. Office Assistant button
   B. Question Mark button
   C. Tips button
   D. None of the above

16. To quickly view the average of a range of cells, use the _____ feature.
   A. Formula
   B. Autosum
   C. Function Wizard
   D. AutoCalculate

17. If the following arithmetic functions all are found in a formula with no parentheses, which one is completed last?

A. +
B. *
C. /
D. ^

18. When Excel automatically sets the width of a column based on the widest entry in the column, it is called _____.

A. Custom fit
B. Choice fit
C. Best fit
D. Close fit

19. The _____ accumulates tips to suggest more efficient ways of completing a task.

A. Help button
B. Office Assistant
C. Tip Wizard
D. What's This? command

20. To alert Excel that you are entering a formula and not text., type a(n) _____ preceding the formula.

A. Ampersand (&)
B. Equal sign (=)
C. Number sign (#)
D. Asterisk (*)

21. You can change the Office Assistant options by _____.

A. Double-clicking Office Assistant
B. Clicking Office Assistant
C. Right-clicking Office Assistant
D. Clicking options on the Help menu

22. A sheet tab name can be up to _____ characters in length.

A. 31
B. 255
C. 12
D. 48

23. To display the _____ for a cell, right-click the cell.

A. Shortcut menu
B. Screen tip
C. Office Assistant
D. AutoCalculate function

Instructions: Circle **T** if the statement is true or **F** if the statement is false.

T **F** 1. The If function determines if a logical test is true or false.
T **F** 2. A function palette is used to enter arguments in a function.
T **F** 3. To average cell contents, select AVERAGE from the Financial category of the Paste function.
T **F** 4. The default chart type is a pie chart.
T **F** 5. The advantage of linking is that any document that is linked to the object is updated automatically if the object is changed.
T **F** 6. An embedded chart is placed on the same sheet as its worksheet.
T **F** 7. To run a Macro, select Run from the Macro selection from the tool bar.
T **F** 8. A Macro is saved in a sheet of workbook called the Macro Sheet.
T **F** 9. To stop recording a macro, use the Stop Macro toolbar.
T **F** 10. A function is entered into only the active cell and can not be copied.
T **F** 11. A range name can be up to 255 characters long.

Instructions: Circle the correct response.

12. Use the _____ function key to change a cell reference in the formula bar to an absolute reference.
A. F5 C. F6
B. F2 D. F4

13. The cell reference A$4 is an example of a(n) _____ reference.
A. Absolute C. Mixed
B. Relative D. None of the above

14. When you Autofill a formula with relative cell references down a row, _____.
A. The row references change in the formula
B. The column references change in the formula
C. No references are changed in the formula
D. The cell reference of the formula remains the same

15. Excel formats dates in _____ format style.
A. 3/1/99 C. 1-Mar-99
B. March 1, 1999 D. All of the above

16. When you create a chart using the Chart Wizard, Excel draws the chart _____.
A. In the middle of the window
B. Below the selected chart range
C. On a new sheet

D. To the right of the selected chart range

17. To change the elevation of a selected pie chart, click _____ on the chart menu.
A. Format Data Series
B. 3-D view
C. Format 3-D Pie Group
D. Chart Type

18. The shortcut key for running a macro is _____ plus the assigned number.
A. CTRL
B. SHIFT
C. F2
D. Alt

19. Macros are written in _____, a programming language.
A. FORTRAN
B. COBOL
C. Basic
D. Visual Basic

20. A(n) _____ chart displays only one data series.
A. Bar chart
B. Line chart
C. Pie chart
D. All of the above

21. A(n) _____ chart shows the relationship of one variable.
A. Bar chart
B. Pie chart
C. Line chart
D. All of the above

APPENDIX G: INFORMED CONSENT

Hello. Thank you for taking the time to participate in this training research. The study is being conducted by Deepanwita Mohanty, graduate student in Psychology, under the direction of Dr. Janelle Gilbert. This research has been approved by the Psychology Department Human Subject Review Board at California State University, San Bernardino, to use human participants. The purpose of this research is to study the trainees' attitudes about computer training and training performance. For this study you will be given two short questionnaires to fill out. One of these questionnaires is enclosed in this envelope. This will ask your demographic information, computer anxiety, and computer self-efficacy. For the purpose of the study, it is essential that you fill out this questionnaire before you receive the training. Please bring this questionnaire to the training session. In the classroom this questionnaire will be collected from you and the other questionnaire will be given to you in a stamped envelope with return address on it. This will include a quiz about the information you have learned and ask your satisfaction with the training program. You can fill this out and mail the envelope at your own convenience. Please do not write your return address on the envelope. Each section of the questionnaires except the training quiz will take approximately five minutes to complete. The training quiz will take approximately ten minutes to be completed.

All information you provide will be held in the strictest confidence by the researchers. At no time are you asked for your name. All data will be reported in group form only. Any information about the trainees in this study will be used for research purposes only. Your participation in this research is completely voluntary and you are free to withdraw and to remove your data at any time during the study without penalty. Any additional questions about this study should be directed to Deepanwita Mohanty at (909) 880-5587. You may obtain a copy of the results after the scores are analyzed. If you have any question about research subjects' rights, contact the University's Institutional Review Board at (909) 880-5027. Once again, thank you for participating in this research.

I acknowledge that I have been informed of and understand the nature and purpose of this study, and I freely consent to participate.

Place a check mark here if you consent to participate _______.
Today's date is _______.

APPENDIX H: DEBRIEFING STATEMENT

The primary purpose of the study you have participated in is to gain a better understanding of the relationship between age and performance at different levels of task complexity. It will also examine the relationship between attitude (self-efficacy and anxiety) and performance.

If you have any question about this study, please contact Deepanwita Mohanty at (909) 880-5587. You may obtain a copy of the results by contacting Ms. Mohanty after June 15, 1999. Your response is anonymous and can be provided in group only. Thank you very much for your valuable help in conducting this research.

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