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## CHALLENGES OF TRAINING PRE-RETIRES TO MAKE SOUND FINANCIAL PLANNING DECISIONS

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*One of the more pressing societal challenges American institutions will face in the coming decades is to ensure that individuals who choose to leave the workforce have made wise financial decisions in preparation for retirement (Cutler, Gregg, & Lawton, 1992). The present study was designed to measure pre-retirees' ability to make accurate decisions about the affordability of retiring from regular employment. The two goals of the investigation were to measure whether knowledge of finance and retirement planning mediated the quality of individuals' decisions, and to determine whether a brief educational training program could be used to improve decision performance. A within-subjects design was employed in which subjects were asked to provide solutions to four realistic retirement planning decision scenarios: two prior to an educational intervention, and two following the intervention. Results indicate that although subjects' knowledge of the domain increased significantly as a function of training, the overall quality of their decisions did not significantly improve from pretest to posttest. Implications of these findings are discussed in terms of both the individual and society.*

The decision to retire from full-time employment is one of the most important decisions any American makes. The import of this decision is related to many facets of adult life: Personal identity is strongly tied to work, and the decision to retire is simultaneously the decision

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to give up an important aspect of one's identity (Atchley, 1985). Retirement frees up large amounts of time and many people have difficulty using this time in enjoyable ways. Retirement also changes the shape of personal relationships, placing husbands and wives together with a frequency and intensity that they have rarely experienced (Lee & Shehan, 1989). But above all else, the decision to retire has major financial import: It brings to an end both an employee's paycheck, and their benefits—benefits that often include funds for future retirement needs.

The financial significance of the retirement decision is further increased by its irreversibility. Once retired, few employers offer employees the opportunity to return to work; at least not to full-time employment at the salary, and with the benefits, they formerly enjoyed. Often, employees who return to work do so on a part-time basis, at lower salaries, and without benefits (Report of the Special Committee on Aging, 1988; Deuterman & Brown, 1978; Loftus, 1988; Owen, 1978; Roncs, 1980; Rosen, 1978). However, in many respects, post-retirement employment is like applying a bandaid to a serious wound; it allows the financially needy to help meet current expenses, but it provides no mechanism for accumulating additional retirement benefits for future needs.

Because going back to work is not an attractive option for most retirees, it becomes more important to time one's retirement correctly in the first place. The core financial issues in the retirement decision is whether or not one's future stream of retirement income will be adequate to meet one's future expenses. Those who retire with the correct knowledge that their retirement income will meet their remaining lifetime expenses, do so on a foundation that will provide a necessary, if not sufficient, basis for a happy retirement (Bosse, Aldwin, & Levenson, 1991; Ekerdt, Vinick, & Bosse, 1989; Singleton, 1985). Those who retire with an incorrect understanding of this question, do so at great peril to the quality of their lives in retirement. A diabolic aspect of financial hardship during retirement is the time when it arrives. It is only after many years that most people realize they retired too soon. This is because the insidious erosion of pension income, savings, and other assets' purchasing power due to inflation, takes from five to ten years to become apparent. In fact, the available demographic data show that the percentage of older people below the poverty level increases with advancing age (Grad, 1990; Schwenk, 1990; U. S. Bureau of the Census, 1990; U.S. Department of Health and Human Services, 1990), which is due, to a great extent, to the amount of time that inflation has had to undermine the value of various sources of retirement income. Furthermore, it is predomi-

nantly women and low socioeconomic groups that are living at the poverty level in retirement (Belgrave, 1988, 1989; U.S. Department of Health and Human Services, 1990; Dressel, 1988; Holden, 1988; Warlick, 1985).

Thus, there are many good reasons to be concerned with peoples' ability to make astute financial decisions about their retirement. It is surprising to note that very little is known about the cognitive abilities that underlie complex financial decision making, or how well people apply their abilities when making these decisions. Although there is much psychological research on decision making and problem solving, little of this work focuses on financial tasks, and even less examines problems as complex as retirement decisions (Klahr & Kotovsky, 1989). In general, this literature has focused on peoples' ability to make simple choices in uncertain situations (Beach & Lipshitz, 1993; Kahneman & Tversky, 1979; Tversky & Kahneman, 1974) or, in the case of financial concerns, has examined peoples' ability to make long-term projections for one variable, such as price inflation (Bates & Gabor, 1986; Hershey, 1995; Jonung, 1986; Kemp, 1986). An exception can be found in a line of recent research by Walsh and Hershey and their colleagues.

In a series of investigations Hershey and Walsh have studied financial decision making in its true complexity (Hershey, 1990; Hershey, Walsh, Read, & Chulef, 1990; Hershey & Wilson, 1997; Walsh & Hershey, 1990, 1993). These studies have examined the ability of well-educated adults of moderately high socioeconomic status, varying in age and expertise, to decide how much working adults should save for retirement.

Hershey et al. (1990), studied experts' and novices' ability to decide how much savings a young working-age couple should contribute to an Individual Retirement Account (IRA). That decision is more complicated than the retirement decision, but the IRA decision includes the retirement affordability issue within it. The findings that are relevant to the present investigation are as follows: Expert financial planners were found to use very little of the available information to reach a decision. On average, they used only 6 of 43 potentially relevant variables. The novice decision makers used more information, although not much more, employing only 9 variables on average. The variables used by the experts were more important in terms of arriving at an accurate decision, and the experts examined each variable only once. In contrast, the novices used less important variables, and they repeatedly looked at the same information. It is surprising to note that the experts did not produce better decisions than the novices—but this result was due to both groups making relatively

mediocre decisions, rather than the novices making particularly good ones.

In another study, Walsh and Hershey (1990) investigated the effects of financial training on the ability of older adults to make an accurate retirement savings decision. In that study, subjects solved six problems in which hypothetical working adults had to decide whether to invest in an employer's 401k savings plan. The study compared the quality of the decisions produced, and the information search processes used by young (mean age 20 years old) and old adults (mean age 68 years old), who had and had not received financial training. Once again, a major finding from this study was how little information both young and old, trained and untrained subjects used to make their decisions. Without training, the old subjects produced significantly better decisions than the young, making average errors of \$3,344 and \$4,892, respectively. Furthermore, the old subjects produced more accurate decisions using an average of 8 variables, as compared to the 9 variables used by the young. With training, however, the young produced much better decisions than the older adults. The young trainees made average decision errors of only \$451, whereas the old trainees made errors of \$3,301. Relative to their untrained counterparts, the young trainees, but not the old, used substantially more variables to make their decisions on the first problem, but they rapidly decreased the number of variables they used over the remaining five problems they solved. The molecular analysis carried out on subjects' decision-making strategies revealed that training had its major impact on the decision quality of the young through the hierarchical level (or importance) of information they used to make their decisions. Young trainees, but not old trainees, used high-level information to arrive at a decision. Furthermore, the more problems the young trainees confronted, the higher the level of information they used to make their decisions, whereas old trainees showed no such change with practice.

Taken together, the studies described above reveal that there is considerable room for improvement in the financial decision-making quality and processes of individuals who vary in age and expertise. Furthermore, these studies have shown that financial training can have a major impact on the decision-making quality and processes of young problem solvers. The possibility remains to show that the performance of older decision makers facing personally relevant financial decisions can be improved through training.

The goal of the present study is to determine the extent to which an educational intervention can effectively enhance individuals' mental models of financial planning for retirement. Central to this

goal will be to determine whether the increases in knowledge brought about through an educational intervention can help to prepare American workers to time properly their departure from the workforce. The main thrust of this investigation was centered around four critical research questions: (a) Can working adults who are nearing retirement age make sound retirement affordability decisions? (b) Can pre-retirees' financial decision-making ability be improved through training? (c) Do individuals who possess strong "mental models" (Gentner & Stevens, 1983) of the financial aspects of retirement planning make better decisions than those with weaker mental models of the domain? And (d) Are there individual differences in the way pre-retirees with strong and weak mental models of retirement planning process critical, task-related information? Each of these questions were thoroughly examined through a series of qualitative and quantitative analyses of the experimental data.

## METHOD

### Participants

Subjects were 23 individuals (18 females; 5 males) who ranged in age from 55 to 65 years (mean age = 59.6 years;  $SD = 3.3$ ). All participants were staff members of one of two major metropolitan universities, who were recruited via campus mail solicitations. Subjects tended to be well educated, having completed an average of 14.9 years of formal education. Seventeen percent were single, 22% were married, and 61% were divorced or widowed. All subjects were employed on at least a part-time basis (minimum 20 hrs. per week), with annual family incomes in the low-to-moderate range (\$15,000–\$40,000). The mean annual family income level was \$26,300.

### Design

The design took the general form of an interrupted time-series analysis, with two observations (decisions) made prior to the treatment (the educational intervention) and two more observations made after the treatment. In a subset of the analyses, scores are reported which are averaged over Observations 1 and 2, and over Observations 3 and 4. This led to analyses that were based on the more familiar within-subjects pretest/treatment/posttest design. Finally, a set of between-group comparisons are reported which contrast the decision performance of "high-knowledge" and "low-knowledge" members of the sample.

## **Procedure**

At the first (pretest) session subjects completed a demographic questionnaire, which was followed by the administration of a finance and retirement planning knowledge test. They were then introduced to the Macintosh-based testing program and given extensive training on how to use the set of specialized financial calculators included in the program. Upon completion of the tutorial, subjects completed two retirement affordability decisions (i.e., the primary task). Immediately following each decision they were asked to rate their impression of various aspects of the task and judge the quality of their decision performance. All subjects were individually tested by a single experimenter. The first session typically took subjects 3 to 5 hours to complete.

During the second (intervention) session participants were presented with detailed information regarding financial aspects of planning for retirement. Details regarding the content of the training session are provided below. Subjects were trained in small groups of one to three persons. Training sessions typically lasted between 3 to 4 hours.

At the third and final (posttest) session, subjects reviewed the tutorial on the financial calculators, and then completed two more retirement affordability decisions (similar to those solved at the first session). A thorough debriefing was provided after all testing procedures had been completed. On average, the final session lasted for 3 1/2 hours.

In order to maximize subjects' interest and level of performance in the program, every effort was made to schedule the experimental and training sessions within 4 to 7 days of one another.

## **Training Program**

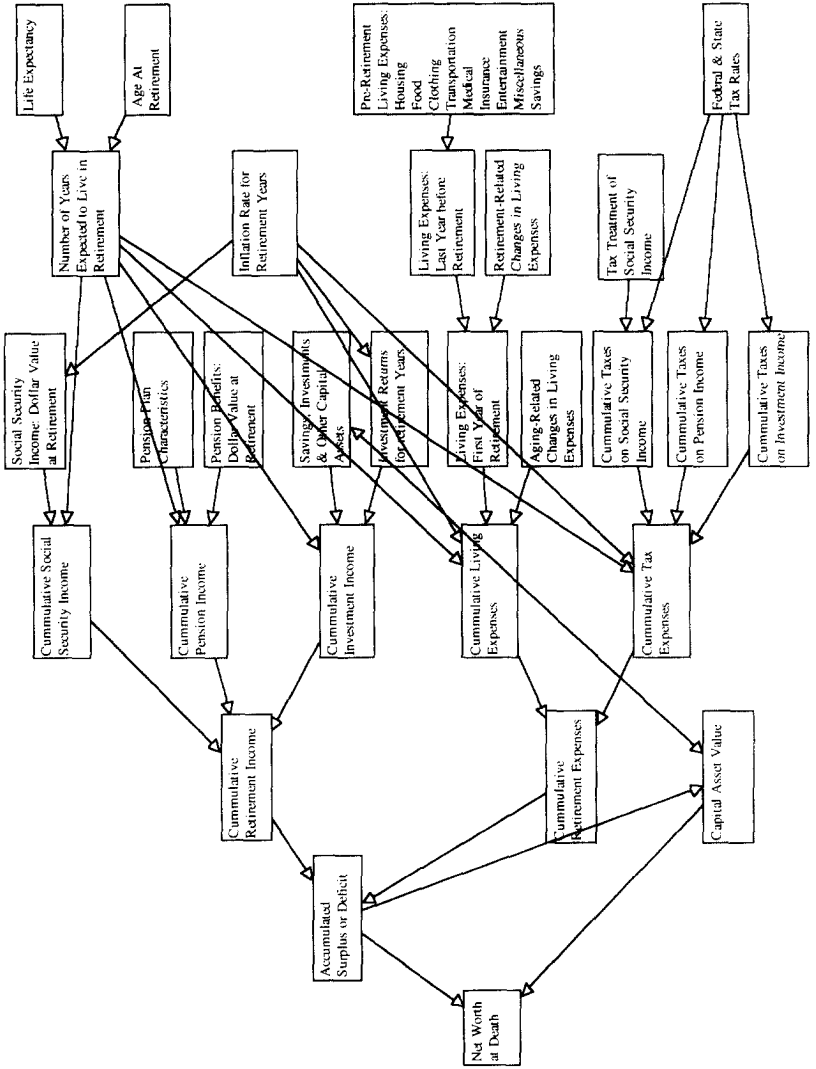
The educational intervention was designed to provide subjects with a foundation of knowledge that would allow them to make accurate retirement planning decisions. The training program stressed five primary topics: (a) sources of retirement income and how they operate (e.g., personal savings, employer pensions, and social security); (b) the effect inflation has on the purchasing power of retirement income; (c) how savings and capital assets can be used to supplement income streams; (d) how one's expenses are likely to change upon entering retirement; and (e) the relationship between personal longevity, the amount of time spent in retirement, and projected retirement expenditures. In addition to material related to the retirement decision, participants were also shown examples of how

financial calculators could be used in order to make long-term financial projections. A professional quality videotape was produced during the early stages of the project which specifically addressed each of the topics listed above. The educational video was shown at each training session in order to ensure that the primary training concepts were conveyed to all subjects in a clear and standardized fashion. Other portions of the training were designed to be highly interactive, including paper and pencil exercises aimed at reinforcing the major educational objectives, structured discussions of hypothetical retirement decision situations, and open discussions of issues related to financial planning for retirement.

### **Task Analysis**

Deciding whether or not one can afford to retire is an inherently complex problem because there are numerous relevant variables to consider which interact with one another in subtle but important ways. For most individuals, the goal of a such a decision is to insure that one's standard of living is maintained throughout the length of the retirement period. Essentially, this involves balancing one's expected income for the entire retirement period against one's projected expenses. If the expected income exceeds the projected expenses, then one can afford to retire. In contrast, in cases where the expenses exceed the income, an unmet need for retirement income exists, and the individual would be well advised to continue working until the inequity between income and expenses becomes balanced. Just a few years of additional employment can have a dramatic effect on one's retirement finances, because it simultaneously increases the resources they will have as support during retirement, and decreases the number of years they will need to support themselves during retirement.

A conceptual model (Norman, 1983) of the problem space for the retirement decision is presented in Figure 1. The information hierarchy contains 37 elements (i.e., separate pieces of information) that would ideally be considered in formulating a thorough solution to the retirement decision. The conceptual model presented in Figure 1 is hierarchically organized in that lower level information (right side of figure) must be computationally combined to determine the value of the higher level nodes in the model. For example, "Age at Retirement" can be subtracted from "Life Expectancy" to derive a value for the "Number of Years Expected to Live in Retirement." The most critical piece of information in the hierarchy is the "Net Worth at Death" which, as described above, involves a balance of the projected values of "Cumulative (Lifetime) Retirement Income" and "Cumula-



**FIGURE 1** Influence diagram representation of a conceptual model for the retirement affordability decision.



tive (Lifetime) Retirement Expenses.” There is support for the veridical nature of this conceptual model of the problem in that it has been previously reviewed and validated by a panel of expert financial planners (Hershey, 1990) and it has successfully been used in other research studies (Hershey et al., 1990; Hershey & Walsh, 1990; Walsh & Hershey, 1990).

### **Computerized Testing Program**

A unique HyperCard financial planning program was designed to assess individuals' retirement planning abilities. The program, which was a second generation instantiation of an existing financial planning program (Carter & Walsh, 1992), allowed for individualized testing and data collection based on a series of four hypothetical retirement planning scenarios. The HyperCard program allowed subjects to select and view a series of “computerized” index cards, each of which contained a specific piece of information (a parameter) about a hypothetical pre-retiree (e.g., David Bell's gross pension income will be \$520 per month). Each decision scenario included one introductory card which was viewed at the beginning of each trial, and 47 additional computerized information cards which resided in a “hidden” database. The introductory card accomplished two purposes: (a) it described the goal of the task to the subject (i.e., to make a retirement affordability decision); and (b) it provided the subject with some basic information about the pre-retiree. One of the actual introductory cards from the experiment contained the following information:

David Bell is three months away from his 62nd birthday and he is wondering whether or not he can afford to retire on his birthday. He would like to retire to pursue personal and family matters but he does not know if he can, given his financial situation.

We would like for you to pretend that you are David's financial advisor, and that you are going to carry out a thorough analysis of his financial situation in order to determine whether or not he can afford to retire on his 62nd birthday. What we want you to determine is how much surplus wealth David will have to leave to his heirs (assuming he can afford to retire), or how much of a deficit David will have incurred (assuming he cannot afford to retire) when he finally dies.

Please continue by telling the experimenter each piece of information that you think you'll need to answer this question. Be as specific as possible in your descriptions of what you'll need.

After subjects read the introductory card they could request any additional information they wanted to know about the individual by

simply asking to see additional cards. Upon such a request, an information card was retrieved from the hidden database and displayed on the screen. However, in order to ensure that subjects were not led to view information they might not otherwise consider, they were never shown the conceptual model of the problem, nor were they informed how many different pieces of information were contained in the hidden database.

The subject was then required to tell the experimenter which specific pieces of information would be needed to make the David Bell retirement decision. The initial stage of the two-stage procedure was concluded once all the requested cards were moved from the "hidden" database to a database shown on the computer screen. In the second phase of the task, subjects were allowed to view the cards one at a time, in order to determine whether the hypothetical individual could afford to retire. This was accomplished by having the subject determine how much surplus money the individual would have, if any, at the time of his or her death (subjects were told to assume that the hypothetical individuals want to continue to live in retirement at the same standard of living they enjoyed while working). After the subject reached a solution, the second phase of the trial was completed, the on-screen database was cleared, and the next trial was conducted in an identical fashion.

Beyond the common core of task information, the scenarios were designed to differ on a number of important dimensions. Two scenarios were based on low income individuals and two were based on moderate income cases. Two pre-retirees were male and two were female. Two of the hypothetical individuals were homeowners and the other two rented housing. Two pre-retirees were contemplating early retirement at age 62, and the other two were contemplating retirement at age 65. In two of the scenarios the hypothetical individual possessed sufficient resources to retire, and in two scenarios there were insufficient financial resources. In developing the four hypothetical scenarios various lifestyle, demographic, and decision factors were partially crossed in an effort to provide subjects with a range of financial planning challenges and situations. The order of presentation for the four scenarios, which differed from one subject to the next, was based on a partial counterbalancing procedure in an attempt to minimize order effects.

An effort was also made to ensure that the parameters selected to create the mock scenarios were reasonable and internally consistent. In a previous study (Hershey, 1990), a panel of expert financial planners were employed to review a set of comparable retirement planning scenarios. These experts concluded that the scenarios were

sufficiently comprehensive to make specific financial recommendations for the hypothetical individuals. As described above, each scenario was designed to fit a particular financial profile (e.g., 65-year-old low-socioeconomic status male with insufficient retirement resources). Complete control over each specific financial parameter allowed for the determination of a precise decision amount for each problem (in dollars), and that amount was used as the objectively correct solution. Measurement of the discrepancy between subjects' solution value and the optimal solution value provided for a sensitive marker of decision performance.

## **RESULTS AND DISCUSSION**

A variety of quantitative and qualitative analyses were carried out in an effort to sketch a comprehensive profile of subjects' decision performance. Reported below are analyses designed to address each of the following substantive issues: (a) Did subjects significantly increase their knowledge of financial planning by attending the training program? (b) How accurate were the decisions subjects made? (c) What impact did training have on subjects' decision performance? (d) What specific types of information did subjects consider when making their decisions, and how was that information processed? And (e), What were subjects' perceptions regarding the nature of the task, and the quality of their own performance?

### **Efficacy of the Training Program**

The efficacy of the training program was assessed as the first step in the analysis plan. Consistent with the goals of the study, it was important to demonstrate empirically that subjects' level of posttraining knowledge was superior to that of their pretraining knowledge. A 28-item financial and retirement planning knowledge questionnaire was developed and used to assess subjects' knowledge of the decision domain at both pretraining and posttraining sessions. This knowledge test was a revised version of a measure used in previous studies of financial and retirement planning (Hershey, 1990; Hershey et al., 1990). The test was designed to assess subjects' understanding of key issues related to the retirement decision such as the following: (a) the amount of retirement income which can be expected from employer pensions and social security; (b) the types of expenses which are typically incurred during retirement; (c) the conditional nature of human longevity projections; (d) and how modest amounts of inflation can have a major impact on retirement expenses over a 10–20 year period.

A *t* test for paired samples was calculated to assess changes in knowledge which resulted from having attended the educational intervention. This test revealed that the pretraining/posttraining knowledge scores were significantly different,  $t(22) = 3.87$ ,  $p < .01$ ; posttraining scores ( $M = 64\%$ ;  $SD = 15.1$ ) were found to be an average of 13% higher than pretraining scores ( $M = 51\%$ ;  $SD = 14.9$ ). This result was important to establish in that it provided justification for a further series of analyses which focus on the impact of training on subjects' decision performance.

### Classification of Subjects into Knowledge Groups

As mentioned above, one of the goals of the study was to examine how individuals' retirement decisions differed as a function of their knowledge of the decision domain. Toward that end, subjects were classified into either low-knowledge (LK) or high-knowledge (HK) groups based on a median split of knowledge test scores from the pretraining session. Figure 2 reveals that the scores of low-knowledge subjects ( $M = 39\%$ ;  $SD = 9.7$ ;  $n = 11$ ) were significantly lower than those of high-knowledge subjects ( $M = 61\%$ ;  $SD = 10.6$ ;  $n = 12$ ),  $t(21) = 5.11$ ,  $p < .01$ . This 22-point difference between means suggests

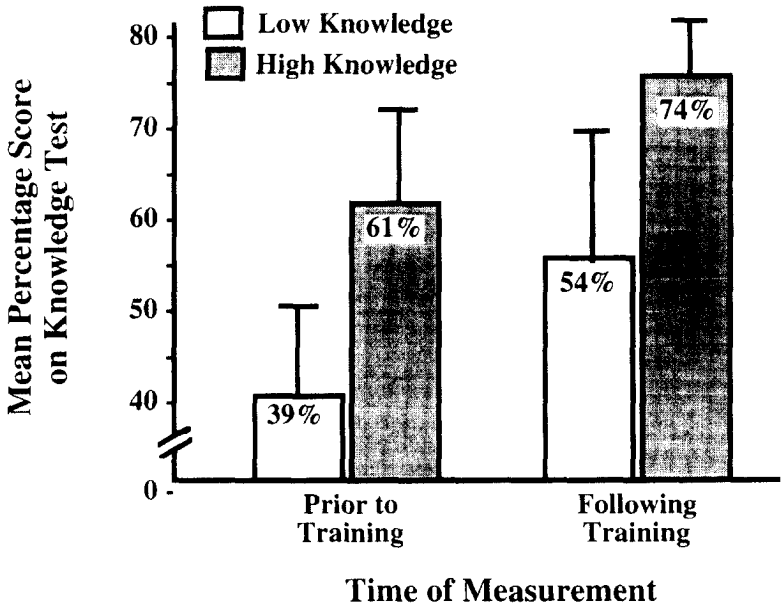


FIGURE 2 Mean differences in knowledge test scores (and standard deviations) as a function of time of measurement.

that there was significant separation between subjects classified into the LK and HK groups.

A similar median split classification procedure was employed to form low-knowledge and high-knowledge groups based on posttraining knowledge test scores (see Figure 1). This split also revealed significant differences between means,  $t(21) = 4.38$ ,  $p < .01$ , with low-knowledge subjects ( $M = 54\%$ ;  $SD = 13.9$ ;  $n = 12$ ) earning scores that were 20 points lower than high-knowledge individuals ( $M = 74\%$ ;  $SD = 6.9$ ;  $n = 11$ ). Again, it was concluded that this range of scores was sufficiently large to permit posttraining analyses of knowledge differences in decision performance.

A closer inspection was made of the overlap in membership of the low- and high-knowledge groups at the pretraining and posttraining sessions. This examination revealed that 73% of subjects in the LK group at pretraining were again members of the LK group at posttraining. Similarly, 67% of subjects in the HK group at pretraining were again members of the HK group at posttraining. Although this high degree of correspondence would not be unexpected given the nature of the median split, it is nonetheless important to point out that a few subjects shifted membership between the LK and HK groups across measurement occasions.

## Decision Quality Analyses

### *Impact of Training on Decision Quality*

Perhaps the most important goal of the present study was to determine whether a relatively short-term educational intervention could be developed which would help individuals to make financially sound decisions about whether they could afford to retire. The applied significance of this issue is considerable given current demographic and socioeconomic trends. Specifically, more people are opting for early retirement, they are living longer than they have in previous years, and they are doing so with no apparent substantial increase in financial resources.

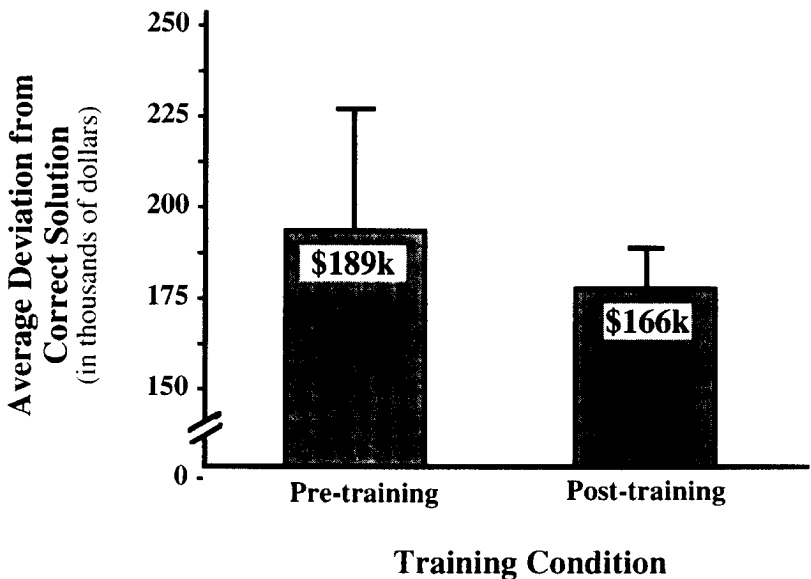
A sensitive index of the quality of subjects' decisions was developed which was based on the average magnitude of their decision errors at both the pretraining and posttraining sessions. This error index was computed by taking the difference between subjects' four recommended decision amounts and the four correct decision amounts. Then, absolute values were taken for each of the resulting difference scores. This resulted in four nondirectional error scores for each subject, one for each of the four problems they solved. The two error scores for the pretraining session were averaged, as were the two error scores

for the posttraining session. For example, if a subject underestimated the hypothetical individual's financial need in the first scenario by \$10,000, and overestimated the need of the second hypothetical individual by \$20,000, then the subject would earn a mean pretraining "error score" of \$15,000 (i.e.,  $\{[|\$10k| + |\$20k|]/2\}$ ).

In order to test whether the training program improved the quality of subjects' decisions, a correlated groups *t* test was performed using the decision quality index as the dependent measure. Although the quality of subjects' performance improved from pretraining to posttraining, the overall reduction in error scores was not statistically significant,  $t(22) = .59, ns$ . As can be seen in Figure 3, subjects' errors averaged \$189,000 per scenario at pretraining and \$166,000 after training. Although the difference in error scores was not significantly different, it is important to note that the \$23,000 reduction in decision error was in the hypothesized direction.

### ***Impact of Knowledge on Decision Quality***

The quality of subjects' decision performance was further examined by seeking to determine whether their knowledge of the task was related to the quality of their solutions at either the pretraining or posttraining sessions. In order to address this issue, a planned com-

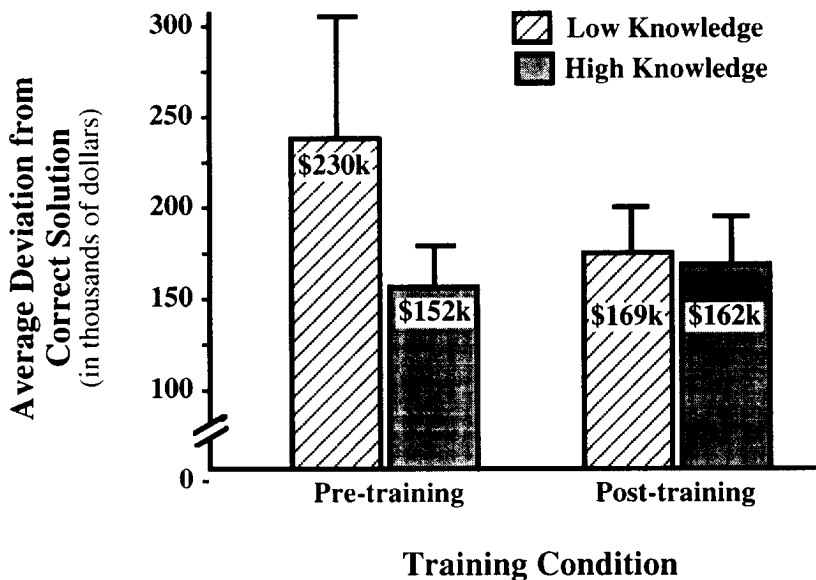


**FIGURE 3** Mean differences in decision quality (and standard errors) as a function of training.

parison was conducted which contrasted LK subjects' pretraining error scores with those of the HK group. Similarly, a second planned comparison contrasted posttraining decision errors for LK and HK groups. As can be seen in Figure 4, there was a substantial difference in the quality of LK and HK subjects' solutions at pretraining. LK subjects' average solution errors were \$230,000 per problem, whereas HK subjects' errors were \$152,000, a difference of \$78,000. A comparison of these means revealed that although the difference was large and in the hypothesized direction, it was not statistically significant,  $t(21) = 1.13, ns$ .

Even though the mean decision errors for the LK and HK groups were nearly identical for the posttraining session (\$169,000 vs. \$162,000, respectively), a second planned comparison was conducted which contrasted these amounts. This comparison also failed to obtain statistical significance,  $t(21) = .18, ns$ .

Although neither of the knowledge-based decision quality comparisons were statistically significant, the pattern of means is suggestive of an interpretable trend regarding the relationship between domain-specific knowledge and decision performance. Before training, LK subjects' errors were, on average, \$78,000 larger per problem than those made by HK subjects. In contrast, the posttraining difference



**FIGURE 4** Mean differences in decision quality (and standard errors) as a function of training condition and knowledge of subjects.

was only \$7,000—an 11-fold reduction in the difference between the two groups. This suggests that the training did, in fact, have a positive impact on the quality of subjects' decisions, but the large variability in the pretraining and posttraining error scores appeared to mask these large group differences.

Perhaps more troubling than the large magnitude of errors made by subjects was the finding that they tended to underestimate the amount of resources which would be needed in retirement. Two of the four scenarios were designed in such a way that the hypothetical individuals required additional resources to cover the cost of retirement. In the one case, there was a large need for additional funds (i.e., a \$318,000 resource shortfall). For that scenario, 91% of subjects were found to *underestimate* the magnitude of the shortfall. In the other need scenario there existed a more modest \$156,000 resource shortfall. In that case, 74% of subjects underestimated the need for additional resources. Averaged across both scenarios, nearly 83% of subjects' estimates fell short of the actual projected cost of retirement. The real-world implications of the tendency to underestimate one's retirement need is quite unsettling from a quality of life standpoint. The error score data reported above suggest that individuals are prone to make large errors when determining how much money they will need to set aside. Furthermore, the analysis of the direction of those estimation errors suggests that there is a strong tendency to systematically underestimate the projected cost of one's retirement (see Hershey, 1995, for a discussion of misperceptions of financial change functions). Therefore, in the future we might expect to see a large proportion of individuals who leave the workforce believing that they have sufficient savings and income streams to cover their living expenses during retirement, when in fact, they do not.

It is important to note, however, that the magnitude of the errors subjects made at posttraining were quite large (when they were performing at their level best). In fact, if subjects had been making real-world projections, then errors of this magnitude would have put them at serious risk of having insufficient resources during retirement. This is indeed a sobering conclusion if one of our societal goals is to ensure that future American workers make sound retirement decisions based on accurate and realistic long-term financial projections.

### **Analysis of Information Considered**

The types of information that were (and were not) used to reach a decision was examined in an effort to understand why subjects made such large errors in estimating retirement needs. In general, there



were few if any differences in the information used by the various groups of subjects. Across nearly all subjects there was a major reliance on a core subset of information: current age, expected longevity, expected gross pension income, expected gross social security income, amount of savings and investments, expected rate of inflation, and expected investment returns. Over 85% of all subjects considered this information in reaching their decisions.

In contrast, 35% or less of the subjects considered the following information: federal and state taxes, home equity, and home mortgage or rent expenses. The lack of attention of these important sources of information probably explains most of the error in subjects' decisions. Home equity is an especially important variable, which was considered by only 16% of pretrained subjects and 36% of the posttrained subjects. Half of the target scenarios included large amounts of home equity as a financial asset—the failure to consider this asset in assessing the affordability of retirement, in itself, could account for much of the average error observed. Although there was a large increase as a result of training in the percentage of subjects who considered home equity, it is surprising that 66% of the subjects ignored this variable after training, given that the significance of this variable was stressed during the training session.

Between the two extremes of information use described above, there were a variety of variables that were considered by 36% to 84% of the subjects. These included future changes in social security and pension benefits (such as the presence or absence of cost of living increases), the hypothetical individual's family situation, and major categories of living expenses such as clothing, food, medical, transportation, travel, and entertainment.

## **Impact of Training and Knowledge on Decision Processes**

In addition to assessing the quality of subjects' performance and tracking the type of information they considered, a number of process-oriented variables were measured in the hopes of better understanding the nature of subjects' cognitive efforts. Specifically, notations were made of the number of parameters subjects considered, the number of repetitive viewings they made of the same parameter (referred to as "recursions"), the number of calculations they completed while making their decision, and the total number of steps they required to achieve a solution (a combination of the number of variables considered, recursions, and the number of computations made). Each of these four variables were measured at both pretraining and posttraining sessions, and performance was averaged

**TABLE 1** Means and Standard Deviations (in parentheses) for the Four Process Variables Presented as a Function of Time of Measurement and Knowledge Condition

Variable	Time of measurement				Mean difference
	Pretraining session		Postraining session		
	Low knowledge	High knowledge	Low knowledge	High knowledge	Mean difference
Parameters considered	13.0 (3.4)	16.2 (3.2)	13.4 (2.2)	16.1 (1.8)	2.7**
Number of recursions	1.18 (2.1)	0.88 (1.8)	0.71 (0.58)	0.27 (0.34)	0.44*
Number of calculations	8.1 (3.9)	10.7 (5.7)	6.2 (3.3)	5.7 (2.5)	0.50
Total number of steps	35.1 (12.0)	47.0 (14.5)	36.0 (9.4)	40.6 (6.8)	4.6

\*  $p < .05$ ; \*\*  $p < .01$ .

across Decisions 1 and 2 to arrive at an overall pretraining score, and Decisions 3 and 4 to arrive at a posttraining score.

Table 1 contains mean scores for each of the four information processing variables shown as a function of time of measurement (pretraining/posttraining) and knowledge condition (HK/LK). Independent  $t$  tests were conducted which contrasted the performance of the high- and low-knowledge groups for each of the four variables at both pretraining and posttraining. Those comparisons revealed that HK subjects used significantly more variables than LK subjects, at both the pretraining ( $t[21] = 2.29, p < .05$ ) and posttraining sessions ( $t[21] = 3.18, p < .01$ ). HK subjects made slightly fewer recursions than LK subjects at the pretraining session ( $t[21] = .37, ns$ ), but significantly fewer recursions following the educational intervention ( $t[21] = 2.16, p < .05$ ). Table 1 also shows that HK subjects took roughly 12 more steps to arrive at a solution than LK subjects at the pretraining session, ( $t[21] = 2.13, p < .05$ ), but this difference diminished to just under five steps at the posttraining session ( $t[21] = 1.33, ns$ ). Finally, there were no significant differences between knowledge groups in terms of the number of calculations they made as part of their decision process.

### Subjective Perceptions of Performance

Following each decision trial subjects were asked to answer a series of five subjective questions which were based on seven-point Likert-type scales. The questions were designed to assess their impressions of the nature of the task and the quality of their performance. Questions related to the task were the following: (1) *How interesting was it for you to work on this problem?* (1 = Not at all interesting; 7 = Very interesting); and (2) *How difficult was it for you to solve this problem?* (1 = Not difficult; 7 = Very difficult). Questions regarding the quality of their performance were (3) *What proportion of all the financial details required to solve this problem do you feel you considered?* (described as the "completeness" question below) (1 = Considered few details; 7 = Considered all details); (4) *Rate the quality of the solution you provided.* (1 = Very poor solution; 7 = Very good solution); and (5) *To what extent do you agree or disagree with the following statement: "I feel confident in dealing with issues related to financial planning for retirement."* (1 = Disagree strongly; 7 = Agree strongly). Subjects' scores for the two pretraining responses were averaged, as were their scores for the posttraining responses. Mean scores based on the entire sample for each of the five questions are shown in Table 2, as a function of each of the two different times of measurement.

**TABLE 2** Means and Standard Deviations (in parentheses) for the Five Self-Perception Questions Presented as a Function of Time of Measurement

Variable	Time of measurement		Mean difference
	Pretraining session	Posttraining session	
Interest	6.2 (0.74)	6.1 (0.93)	0.10
Difficulty	3.6 (1.8)	3.5 (1.5)	0.10
Completeness	5.1 (1.2)	5.0 (0.96)	0.10
Quality	4.6 (1.2)	5.2 (1.1)	0.60**
Confidence	4.4 (1.6)	5.0 (0.96)	0.60

\*\*  $p < .01$ .

When interpreting these scores, two different sources of information can be considered in order to learn more about subjects' perceptions of the task. The first is the *magnitude* of subjects' ratings (where did their scores fall on the seven-point range?), and the second involves examining the *magnitude of the difference* of their ratings as a function of time of testing (i.e., was there a change in perceptions between pretraining and posttraining?). Consider the first set of scores shown in Table 2 which reflect subjects' *interest* levels while working on the problems. The magnitude of subjects' responses (means of 6+ on a 7-point scale) suggest that on the whole, they found the task to be quite interesting. Furthermore, an examination of the magnitude of the difference score (a small 0.10 point shift) reveals that there was no appreciable change in their interest level from pretraining to posttraining,  $t(22) = .26$ , *ns*. Analysis of the second question revealed that subjects found the task to be moderately *difficult* (means of 3.5, with a scale midpoint of 4); moreover, they did not report that the level of task difficulty was appreciably different following training,  $t(22) = .17$ , *ns*. Taken together, these two findings suggest that any pretraining/posttraining differences in the nature of subjects' decision performance could not be attributed to differential interest levels, nor changes in their perception of the difficulty of the task.

Further inspection of the scores in Table 2 reveal that subjects believed their decisions were based on a reasonable search of the problem space. That is, for the *completeness* question, they indicated that had considered most of the details in formulating their solutions, and they felt moderately *confident* in dealing with issues related to

financial planning for retirement. Furthermore, neither of these variables indicated a significant shift in perceptions following training ( $t[22] = .52$ , *ns*; and  $t[22] = 1.61$ , *ns*, respectively). Finally, subjects indicated they believed that the *quality* of their solutions were moderately good, despite the fact that the actual quality of their decisions were quite poor. The data also indicate that subjects believed that the quality of their solutions increased significantly following training,  $t(22) = 3.25$ ,  $p < .01$ . This finding suggests that some form of halo effect may have been operating, inasmuch as the actual quality of subjects' decision performance did not increase significantly as a function of training.

A final set of analyses were conducted which were designed to determine whether there were differences in subjects' ratings on the five subjective items as a function of knowledge group status. These analyses failed to contribute any additional insights over and above those outlined above based on the set of full sample comparisons.

## CONCLUSIONS

The clearest conclusion that can be drawn from this research is that individuals, in general, are very poor at estimating the balance between financial need and financial resources across the years of retirement. The average results from our study show that, as a group, subjects made mistakes equal to about 5 to 8 years of retirement income (an average error of \$177,500).

Although certain key tests failed to obtain statistical significance, there was a general trend which suggested that financial training and increased levels of financial knowledge were related to more accurate retirement affordability decisions. But the improved accuracy associated with training and higher levels of financial knowledge were far from adequate for producing what would be considered accurate financial decisions. On average, subjects still made errors equal to 4 to 7 years of retirement income after completion of the training seminar (an average error of \$166,000 after training as compared to an error of \$189,000 before training). Furthermore, although HK subjects made more accurate decisions than LK subjects, they did not seem prepared to chart the course of their own retirement finances accurately (on average, HK subjects made errors of \$152,000 as compared to the \$230,000 average errors made by LK subjects).

The detailed analyses of the decision processes of subjects did show some statistically significant improvements as a result of both training and financial knowledge. Trained subjects and HK subjects

considered more information, and processed it more efficiently than untrained and LK subjects. Although this increase in the amount of information used and improved efficiency did not translate into statistically significant improvements in decision accuracy, it was reflected in their subjective beliefs about their performance. After training, subjects rated the quality of their decisions as better than the decisions they made before training, and they showed a comparable increase in their confidence to handle retirement decisions on their own. These latter findings suggest that commercial financial training seminars may do more harm than good—individuals may feel confident that the quality of their financial planning efforts are sound, despite clear objective evidence to the contrary.

Although the results of this study are disappointing in contrast to our original expectations of showing major training-related and knowledge-related improvements in decision quality, they are, nonetheless, of considerable importance. They show that the typical American worker is very unlikely to estimate accurately the balance between his or her financial need and financial resources when deciding on an age to retire. Furthermore, these results suggest that pre-retirement seminars are unlikely to add much to the accuracy of these financial decisions. The complexity of balancing financial need against financial resources over 12 to 20 years of retirement, in an economic environment of inflation and compounding investment returns, seems just too great of an intellectual challenge for most Americans to surmount on their own.

How should Americans decide when they can afford to retire, given these difficulties in arriving at accurate estimates of the affordability of retirement? A more productive approach than attempting to teach them how to carry out these computations on their own might involve developing computer-based decision aids that would complete a financial analysis for them. This form of decision aid could be designed to request the information required to reach a correct financial analysis and then provide a detailed output for each future year of retirement of the balance between expenditures and resources.

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