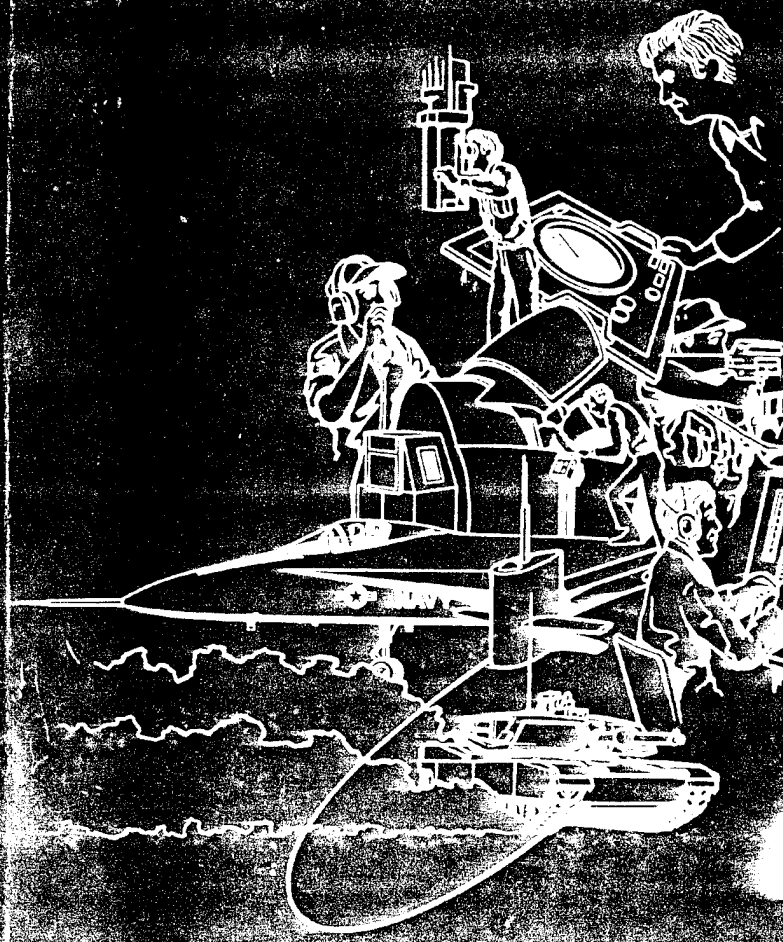
NAVAL AIR WARFARE CENTER
TRAINING SYSTEMS DIVISION
ORLANDO, FLORIDA

TECHNICAL REPORT 93-011

FACTORS THAT INFLUENCE TRAINING EFFECTIVENESS: A CONCEPTUAL MODEL AND LONGITUDINAL ANALYSIS

AUGUST 1993



CENTER OF EXCELLENCE FOR SIMULATION AND TRAINING TECHNOLOGY

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Training Systems Division

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Recent advances in technology and rapid changes in the world have placed increasingly stringent demands on the human operator in many military systems. The need for improved and more varied skill levels, coupled with current fiscal constraints, requires that modern military training systems impart the complicated, higher-order skills required to operate modern combat systems. Furthermore, this must be accomplished in less time, and with a lower dollar investment than in recent history. Therefore, the modern training challenge demands an optimization of training resources--a return on investment that results in an umcompromisingly high level of readiness at the lowest possible cost, and in the shortest time.

The purpose of the present research was to advance understanding of effective training system design by investigating factors that may significantly affect the success of training in terms of performance improvement in the operational environment. The

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benefit of such work is that it can lead to generalizable training design guidelines that will increase the probability of effective training with a relatively small investment.

In order to accomplish this goal, a comprehensive model of training effectiveness was developed by synthesizing several diverse literatures. This model was used as a basis to specify testable hypotheses. A large-scale data collection effort was then conducted with Navy recruits as an initial test of predictions from the model.

Results indicated that several "non-technical" factors had a significant impact on training outcomes in this setting. These factors included: self-confidence, task-related attitudes, expectations for training, training fulfillment, and pre-training motivation. In addition, it was found that training expectations, self-efficacy, commitment and training motivation were all significant predictors of attrition (i.e., those trainees with higher expectation, self-efficacy, commitment and motivation were more likely to complete training).

Overall, these results imply that no matter how well designed a training system is, training effectiveness will not be optimized without a consideration fo pertinent individual and organizational factors. Therefore, a process view of training effectiveness should yield dividends in terms of an improved understanding of crucial training variables and, in turn, enhanced training outcomes. The framework developed here can guide future research and continue to increase our understanding of why training is effective.

EXECUTIVE SUMMARY

PROBLEM

Recent advances in technology and rapid changes in the world have placed increasingly stringent demands on the human operator in many military systems. The need for improved and more varied skill levels, coupled with current fiscal constraints, requires that modern military training systems impart the complicated, higher-order skills required to operate modern combat systems. Furthermore, this must be accomplished in less time, and with a lower dollar investment than in recent history. Therefore, the modern training challenge demands an optimization of training resources--a return on investment that results in an uncompromisingly high level of readiness at the lowest possible cost, and in the shortest time.

OBJECTIVE

The purpose of the present research was to advance understanding of effective training system design by investigating factors that may significantly affect the success of training in terms of performance improvement in the operational environment. The benefit of such work is that it can lead to generalizable training design guidelines that will increase the probability of effective training with a relatively small investment.

APPROACH

In order to accomplish this goal, a comprehensive model of training effectiveness was developed by synthesizing several diverse literatures. This model was used as a basis to specify testable hypotheses. A large-scale data collection effort was then conducted with Navy recruits as an initial test of predictions from the model.

RESULTS

Results indicated that several "non-technical" factors had a significant impact on training outcomes in this setting. These factors included: self-confidence, task-related attitudes, expectations for training, training fulfillment, and pre-training motivation.

CONCLUSIONS

Overall, these results imply that no matter how well designed a training system is, *training effectiveness will not be optimized without a consideration of pertinent individual and*

organizational factors. Therefore, a process view of training effectiveness should yield dividends in terms of an improved understanding of crucial training variables, and in turn, enhanced training outcomes. The framework developed here can guide future research and continue to increase our understanding of why training is effective.

RECOMMENDATIONS

As a result of this effort, several preliminary recommendations for training can be offered. These include:

1) The level of self-efficacy of trainees should be assessed prior to training.

2) Remedial training to raise self-efficacy levels prior to training will enhance the probability of positive training outcomes.

3) Trainees should be led to have realistic expectations for training. Interventions to meet this objective should be designed.

4) Interventions designed to increase trainee commitment to the organization will enhance the likelihood of successful training.

5) Efforts to improve trainee motivation prior to training can lead to better training outcomes.

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INTRODUCTION

Fleet readiness, safety, and performance depend largely on the extent to which training systems impart crucial knowledge and skills. Further, current fiscal constraints demand that military training resources are optimized--that is, that they accomplish required training objectives at the lowest cost and in the shortest amount of time. It is generally agreed, therefore, that attention must be directed toward understanding the factors that influence training effectiveness and transfer of training, so that the highest payoff in terms of performance improvement can be achieved.

PROBLEM

Past research into training system design has most often concentrated on a relatively small set of variables, such as training method, content, media, and equipment. While this research is important (i.e., training variables are a crucial part of the effectiveness equation), training effectiveness is a complex phenomenon. There are numerous factors which can influence training effectiveness independent of training quality. As Goldstein noted, "we must consider training as a system within work organizations rather than simply treating instruction as a separate technology" (1980, p. 263). We need to better understand the many factors that may contribute to, or detract from, training effectiveness. In particular, there is a need to examine a variety of often overlooked variables in the training equation; these variables include trainee attitudes, expectations, and motivations (Noe, 1986), and organizational/ situational factors (e.g., supervisor support in the transfer environment) (Noe & Schmitt, 1986). In addition, there is a need to apply relevant theories to guide the generation of hypotheses about training system design, and to provide a basis upon which to make design decisions (Cannon-Bowers, Tannenbaum, Salas, & Converse, 1991).

The consequences of failing to specify and consider all potentially important factors in training system design (and perhaps more importantly, the relationship among factors) are both practical and theoretical. From a theoretical standpoint, neglecting important factors in the training equation makes it difficult to determine <u>why</u> training may or may not have been successful, or how it might generalize to other environments (Campbell, 1988; Cannon-Bowers et al. 1991; Tannenbaum & Yukl, 1992). Related to this, it is difficult to generate general principles of training system design since it is unclear why, or by what mechanisms, training is successful or unsuccessful. On a more practical level, there may be a sub-optimization of training resource allocation and expenditure, and of training

effectiveness since design decisions are not based on sound principles of training. For example, a training course that fails due to low trainee motivation upon entering the program, may lead a designer to conclude erroneously that the failure was due to the training methods that were employed.

Recently, several researchers in the training area have contended that a host of factors, not typically considered in training design research, may have a significant impact on training effectiveness (Noe, 1986; Tannenbaum & Yukl, 1992). In general, these factors can be characterized as those that a trainee brings to the training situation, those related to the training system itself, and those stemming from the organizational or operational context in which the training occurs. Research in this area has suggested that factors such as job involvement, performance expectations, training fulfillment, career planning, and organizational favorability can all have an impact on training effectiveness (Mathieu, Tannenbaum, & Salas, 1992; Noe & Schmitt, 1986; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991).

Another area of interest to the current research relates to the need to define the concept of "training effectiveness" itself. Specifically, it has been typical in past work to treat training effectiveness as a relatively simple, uni-dimensional construct. A notable exception here is the theorizing of Kirkpatrick (1976), where the concept of training effectiveness was decomposed into several separate outcomes: reactions, learning, behavior, and organizational results. According to Kirkpatrick, training can have an impact on any (or all) of these outcomes. With respect to the current research, it is our contention that specifying and assessing various components of training effectiveness is crucial to a full understanding of how and why training is successful. Moreover, it is reasonable to hypothesize that particular training system features will have a differential impact on various outcomes. For example, trainees may respond favorably to a training program without actually learning targeted material, or they may learn targeted concepts but be unable to apply these to the job.

The purpose of the current research was to extend past work in the training effectiveness area by specifying a comprehensive model of training effectiveness, and studying directly the impact of selected individual and situational factors on various training effectiveness components in a Navy training environment. Of particular interest was the study of individual factors, including those factors that a trainee brings to the training program which affect his/her ability to acquire and apply targeted skills, and how these affect important training outcomes.

OBJECTIVE

The objectives of the current research were to: 1) synthesize several diverse literatures in order to develop a comprehensive model of training effectiveness that would provide a framework in which to investigate the impact of training effectiveness factors; 2) determine empirically how, and to what extent, selected training effectiveness factors affect training outcomes in a military training environment; and 3) begin to derive recommendations for incorporating knowledge about training effectiveness factors into the design of training systems as a means to enhance training effectiveness.

APPROACH

A series of research questions was first generated to guide subsequent research and model development. These included:

1) Which organizational and individual factors are likely to affect training effectiveness?

2) What are the important components or categories of training effectiveness?

3) What is the relationship among factors that affect training effectiveness?

4) How can these factors be measured reliably?

5) What is the impact of organizational and individual factors in an actual training environment?

6) How might data regarding the impact of these factors on training effectiveness be used to improve the design of training systems?

To begin to answer these questions, a review and synthesis of diverse literatures was first conducted. This included the educational, cognitive, industrial, and social psychology literatures, as well as the instructional design and general management/business literatures. Based on this review, a comprehensive model of training effectiveness was developed in order to: delineate the most important organizational and individual factors that are hypothesized to affect training outcomes (question 1 above); delineate the various facets of training effectiveness (question 2 above); and describe how these variables might be related to one another, and to training effectiveness (question 3 above).

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BACKGROUND: A MODEL OF TRAINING EFFECTIVENESS

A detailed review of the diverse literatures that are related to training effectiveness was conducted. As a result of this review, a model of training effectiveness was developed, with particular attention to individual characteristics, expectations, and motivation. This model was designed to reflect the current body of knowledge regarding training effectiveness, and to guide current and future research efforts. It is not a causal model per se, but instead, should be viewed as a heuristic for conceptualizing and examining training effectiveness.

The model has several important features. First, it takes a longitudinal, process-oriented perspective that considers events that occur before, during, and after training, and their effect on training effectiveness. Second, it focuses on training within the organizational or work context. It acknowledges that training does not occur in isolation from other organizational events. Third, it reconsiders Kirkpatrick's (1976) training evaluation typology, yielding a revised framework with greater detail and additional training outcomes (more will be said about this in a later section). Fourth, it incorporates, explicitly, trainee expectations, trainee attitudes, and pre- and post-training motivation, several factors that have tended to be overlooked in previous research on training effectiveness. The model is shown in Figure 1.

Inspection of Figure 1 indicates that the model contains several key classes of variables (e.g, individual variables, organizational/situational characteristics). Some of these are composed of several variables that will be discussed in detail later in this report. Table 1 lists all of the relevant variables, categorized according to the boxes in the model.

Moving from left to right, the model hypothesizes first that individual variables (e.g., attitudes, self-efficacy), and organizational/situational characteristics (e.g., organizational climate, trainee selection process) influence trainees' expectations and desires. Similar factors influence trainees' motivation to attend training, while individual, organizational, and training characteristics influence trainees' motivation to learn.

The model next specifies that a training needs analysis should reflect individual, organizational, and task characteristics, and should drive the training method and content. Once training is completed, training fulfillment becomes crucial. Training fulfillment is defined as "the extent to which the training met trainees' expectations and desires."

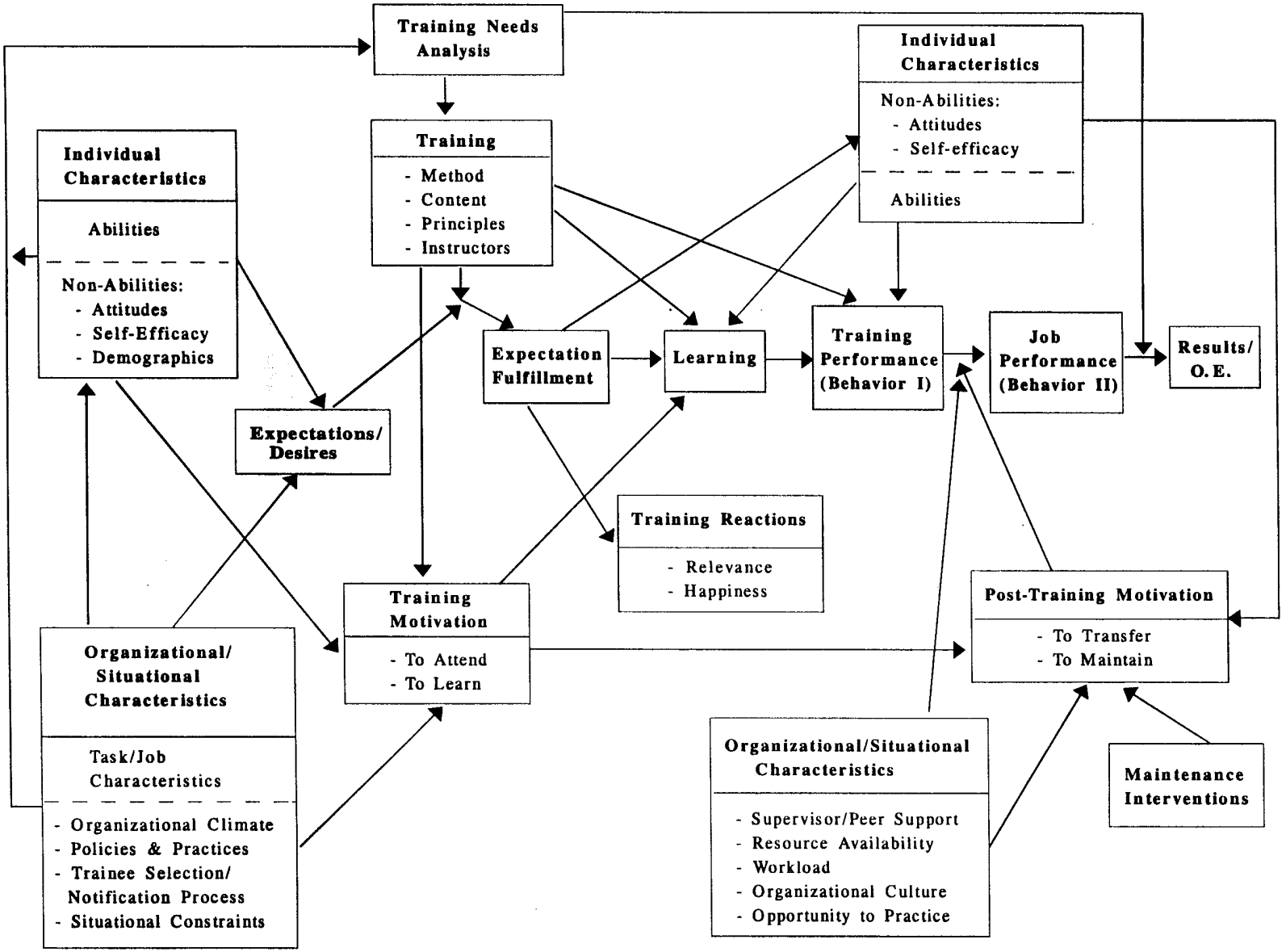

Figure 1: Model of Training Effectiveness

Table 1
Variables in the Training Effectiveness Model

Individual Characteristics (Pre-Training)
- Abilities
  - cognitive ability
  - psychomotor ability
  - learning rates/trainability
- Attitudes
  - commitment
  - intent to remain
  - career planning
  - job satisfaction
  - reactions to previous training
  - coworker/teammate relations
- Self-Efficacy
  - physical self-efficacy
  - cognitive self-efficacy
  - task-specific self-efficacy
- Personality
  - locus of control
  - ego strength
  - need for achievement, affiliation
  - conformity
- Demographics
  - family history
  - age
  - gender
  - education
- Experience
  - tenure/experience with company
  - with task
  - with previous training

Organizational/Situational Characteristics (Pre-Training)
- Organizational Climate
  - participatory versus centralized
- Trainee Selection/Notification Process
  - voluntary vs. mandatory attendance
  - reward vs. punishment
  - communication medium, accuracy
- Purpose of Training
  - maintenance vs. advancement
- Task or Job Characteristics
  - task complexity
  - task type
  - task difficulty
  - feedback
- Organizational History
  - management-labor relations
  - growth/decline
- Organizational Policies, Programs, & Practices
  - other human resource practices
  - other company practices

Trainee Expectations
- Training Performance Expectations
- Training Expectations
  - training format
  - challenge
  - degree of interactions
  - focus of content
- Training Desires
  - training format
  - challenge
  - focus of content

Pre/During Training Motivation
- Motivation to Attend
- Motivation to Learn

Training Program Characteristics
- Training Needs Analysis
  - accuracy of need identification
  - involvement of potential trainees
- Training Method/Process
- Use of Training Principles
- Training Content
- Instructor Characteristics
- Use of Technology

Expectation Fulfillment
- Perception/Expectation Match

Programmed Interventions
- Relapse Prevention
- Transfer Support Programs

Training Effectiveness
- Training Reactions
  - training relevance/perceived value
  - affective responses/happiness index
- Learning
- Training Performance
- Job Performance
- Results/Organizational Effectiveness

Post-Training Individual Characteristics
- Attitudes
  - commitment
  - intent to remain
  - job satisfaction
  - coworker/teammate relations
- Ability
  - task specific ability
- Self-Efficacy
  - physical self-efficacy
  - cognitive self-efficacy
  - task specific self-efficacy

Post-Training Motivation
- Motivation to Transfer and Maintain

Organizational/Situational Variables - Post Training
- Transfer Environment
  - supervisor support
  - co-worker support
  - resource availability (time, equipment)
  - workload
  - job security
  - authority/autonomy
- Organizational Culture
  - openness to innovation/risk taking

It is directly related to training reactions; more specifically, training that meets or exceeds expectations and desires should exhibit more positive trainee reactions.

Learning is a function of the following: training content, method, and process; trainees' motivation to learn; and trainee ability. Training and ability may interact in determining learning. Training performance is a function of training content and method, learning, and trainee ability.

Post-training motivation is influenced by post-training organizational/situational characteristics (e.g., supervisor and peer support) and any maintenance interventions (e.g., relapse prevention programs). Job performance, or transfer, is a function of training performance moderated by post-training motivation to transfer, as well as post-training organizational/ situational characteristics (e.g., resource availability). The rationale is that trainees who can perform the task during training will also perform it back on the job if: (1) they want to, and (2) they have the necessary resources.

Finally, results/organizational effectiveness is a function of job performance, moderated by the accuracy of the training needs analysis. The rationale here is that behavior change resulting from training should contribute to organizational effectiveness to the extent that the training addressed the appropriate organizational, individual, and task needs.

It should be noted that the attitudes, skills, learning, and organizational changes that result from a given training program will serve as antecedents of expectations, desires, and training motivation in subsequent training programs.

MEASURING TRAINING EFFECTIVENESS

As noted, the construct of training effectiveness has often been treated as a simple, uni-dimensional construct in past work. However, it is our contention that training effectiveness is a more complex construct, with several facets or components. The following sections expand upon these notions regarding training effectiveness.

To begin with, training effectiveness can be defined as *the extent to which training yields desired or relevant outcomes.* Training effectiveness is usually assessed via a training evaluation study, which involves comparing post-training performance to a specified criterion or standard. There is not a single, all-encompassing, universally accepted training effectiveness criterion, nor should there be. Different training programs have different goals and processes, and thus require

different measures of training effectiveness. However, while the specific measures may vary, it is possible to categorize effectiveness measures on the basis of similar features.

D.L. Kirkpatrick (1959a, 1959b, 1960a, 1960b, 1976) proposed a typology of training evaluation that partitioned training effectiveness into four steps. The four steps are:

1) Reactions: How well did the trainees like the program? What were their feelings about the training?

2) Learning: What principles, facts, and techniques were learned, understood, and absorbed by trainees?

3) Behavior: What changes in job behavior resulted from the training? Were trainees using learned principles and techniques on the job?

4) Results: What were the tangible results of the program in terms of reduced cost, improved quality, improved quantity, and so forth?

Kirkpatrick's typology has helped guide numerous research and training evaluation efforts, and is probably the most frequently cited framework for understanding training effectiveness. The usefulness and power of Kirkpatrick's model has been its simplicity, and its ability to help people think about training criteria (Alliger & Janak, 1989). However, in some respects, it lacks sufficient detail or is ambiguous, and it fails to consider other possible training outcomes.

We are proposing a revision to Kirkpatrick's typology that addresses more fully the training effectiveness criterion space. It has particular relevance to the way the military evaluates its training, but should also be generalizable to other training environments. The six proposed categories of training effectiveness are:

1) Reactions

2) Attitude Change

3) Learning

4) Training Performance (Behavior I)

5) Job Performance (Behavior II)

6) Results/Organizational Effectiveness

All six categories are depicted in Figure 1. With the exception of attitude change, each is shown explicitly. Attitude Change is implied in two locations: 1) it can be considered part of the post-training "individual characteristics" box, and 2) it is part of the "post-training motivation" box. Each category of training effectiveness is addressed in detail below.

Reactions

This category is similar to Kirkpatrick's Reactions category. However, "Reactions" is probably best thought of as a multidimensional construct. Specifically, it includes an affective response, or liking, component (including an assessment of hygiene-type factors, such as length of training and conditions) as well as trainee perceptions of the usefulness/relevance and perceived value of the training. It should be noted that Reaction measures are the most common form of training evaluation (Brown, 1980; Saari, Johnson, McLaughlin, & Zimmerle, 1988; Swierczek & Carmichael, 1985).

Attitude Change

Trainees may leave training with different perspectives than when they entered. The training experience may have an effect on trainees' self-efficacy (Gist, 1987), attitudes toward teamwork or quality (Helmreich, Foushee, Benson & Russini, 1986), motivation (Latham, 1989), commitment (Tannenbaum, et al., 1991), and intent to remain with the organization, to name just a few possible effects. These changes are referred to broadly as Attitude Change. In fact, some training programs are designed with attitude change as a primary focus. For example, several airlines routinely conduct crew coordination training where the primary focus is on changing crew members attitudes towards teamwork (see Prince & Salas, 1993). Moreover, some management training is designed specifically to foster a change in organizational climate (Moxnes & Eilertsen, 1991).

Some training is designed to affect motivation or trainee resource/effort allocation, rather than skill acquisition, although it is likely that training that affects both effort and skill would have the greatest impact. Nonetheless, trainee motivation after completing training could be an appropriate index of training effectiveness in some instances. For example, according to a meta-analytic review, for the most part, training designed to change motivation and values in supervisors does appear to do so (Burke & Day, 1986).

Another important attitude that can be affected by training is self-efficacy. Self-efficacy refers to the belief in one's capability to perform a specific task (Bandura, 1977), and has been shown to be related to subsequent performance (Barling &

Beattie, 1983; Taylor, Locke, Lee, & Gist, 1984). In fact, behavior modeling may be an effective training method because of its impact on self-efficacy. Further, changes in self-efficacy are considered a key part of the cognitive-behavioral relapse process (Marx, 1982).

Along this line, a study by Hill, Smith, and Mann (1987) confirmed the Bandura (1977) findings that performing a behavior otherwise thought to be impossible is likely to increase self-efficacy, and further revealed that experience is not likely to influence decisions to learn about, or use newly learned skills, unless self-efficacy has been affected. In other words, post-training self-efficacy should affect trainees' motivation to transfer and to use newly acquired skills and knowledge. For this reason, several authors have noted that post-training self-efficacy should be considered an important outcome of training, and one potential indication of training effectiveness (Gist, 1987; Latham, 1989; Tannenbaum & Yukl, 1992). That is, to the extent that training results in increased trainee self-efficacy, it may be deemed effective.

Furthermore, to the extent that self-efficacy generalizes across situations, referred to as "generality" by Bandura (1977), it could yield additional dividends by improving subsequent performance on non-trained tasks as well. Kanfer and Ackerman (1989) concluded that "additional research to clarify the determinants of transfer of self confidence expectations across tasks has important practical implications for training" (p. 686).

Training can also have an impact on attitudes such as satisfaction and organizational commitment. In fact, an investment model based on exchange theory (see Farrell & Rusbult, 1981) would suggest that training could be considered an organizational investment in its employees, and actually viewed as a reward by some employees. To the extent that training at company X is viewed as valuable and better than company Y, theoretically, it could add to satisfaction and commitment. Empirically, Louis, Posner, and Powell (1983) found a positive relationship between perceptions that training was helpful, and employee satisfaction and commitment.

Learning

As conceptualized here, learning is a cognitive process referring to the acquisition of knowledge. Learning may be manifested in the amount of knowledge acquired, or in the structure of the knowledge acquired (see Goldsmith, Johnson, & Acton, 1991; Kraiger, Ford, & Salas, 1993). Learning does not imply that the trainee *can* perform a task differently, but simply that he/she has acquired knowledge *with which* to perform a task

differently. It addresses questions such as: can trainees recite new information after training?; and can they verbalize new strategies, concepts, or approaches to performing a task?

The cognitive psychology and learning literatures have delineated different aspects of the learning process, including the acquisition of declarative knowledge (the "what" component), procedural knowledge (the "how" component), and conditional knowledge (the "when and why" component) (Anderson, 1985; Cassidy-Schmitt & Newby, 1986; Kanfer & Ackerman, 1989). These may be assessed at the Learning level of training effectiveness by constructing knowledge tests, or they may be assessed as part of behavior change. Kyllonen and Shute (1989) presented a taxonomy of learning skills that may be of value in considering the types of learning that can be measured. Quite recently, Kraiger et al. (1993) expanded the concept of learning measures to incorporate several more cognitively-oriented assessment devices.

Burke and Day (1986), in their meta-analysis of management training effectiveness, partitioned learning into subjective learning, i.e., principles, facts, attitudes, and skills that were learned as communicated in statements of opinion, belief, or judgment by trainee or trainer, and objective learning, i.e., knowledge assessed through knowledge tests and other related measures. Subjective learning, as they define it, would fall into our category of training Reactions - relevance/perceived value. In general, our learning category is consistent with Burke and Day's (1986) objective learning category.

Training Performance

In an expansion of Kirkpatrick's typology we partition behavior into two categories: (1) Training Performance, and (2) Transfer Behavior. In contrast to the Learning category, both denote that the trainee can perform the task differently, thereby incorporating the demonstration or execution of behavior change. Training Performance assesses behavior change prior to the transfer environment. Transfer Behavior assesses behavior change after returning to the job.

Training Performance goes beyond Learning by requiring that trainees show that they can incorporate the knowledge they have acquired into their actions. The requisite skills and abilities needed to demonstrate Training Performance and Learning may be different. For example, a medical trainee may be able to recall the steps for a particular surgical procedure (Learning), but may lack the manual dexterity to perform the procedure during a simulated operation (Training Performance). Training Performance can be measured through the use of role plays, simulations, or work samples. For tasks that have only a cognitive element and

do not have a behavioral component, the distinction between Learning and Training Performance may be irrelevant.

To further clarify, Training Performance, as defined here, approximates more of a "maximum" performance criterion than a "typical" performance criterion. *Maximum* performance measures are characterized by: (1) an explicit awareness of being evaluated, (2) an acceptance of explicit instructions to maximize effort, and (3) a short enough measurement period to allow focused attention on the goal (Sackett, Zedeck, & Fogli, 1988). They reflect the fact that the trainee is doing his/her "best" for the purpose of demonstrating mastery of targeted material. In contrast, *typical* performance criteria refer to the level of performance that would be displayed by a trainee when he/she is not being evaluated explicitly (i.e., during routine or typical performance sessions). Maximum and typical performance criteria reflect somewhat different phenomena (Sackett, et al., 1988).

For most military situations, Training Performance is the highest level of training effectiveness measure assessable during peace time. The Government Accounting Office (GAO) (June, 1986) noted that, "Most military officials we interviewed consider joint exercises, such as the annual 'Return of Forces to Germany' and combined arms and interservice training... (and training centers and ranges)... to be the best evaluations of unit performance" (p. 14). The Navy conducts Operational Training Assessments to determine how well training has prepared the ship and its crew for deployment. These simulations can be viewed as the highest level of Training Performance (Behavior I) measures possible, and may be particularly useful for assessing team training effectiveness. However, these exercises only simulate combat. True combat situations add considerable stress, and are inherently inappropriate for collecting training effectiveness data.

Transfer Behavior

As with Training Performance, Transfer Behavior implies behavior change. However, it goes beyond Training Performance. Training Performance assesses the question, can the trainee perform the task differently? Transfer Behavior assesses the question, does the trainee perform the task differently after he/she has returned to the job? The former reveals behavioral capability, the later behavioral change.

As Baldwin and Ford (1988) noted, transfer of training to the job includes the generalization of learned material to the job, as well as the maintenance of training skills over a period of time on the job. The generalization of learned material constitutes two forms of transfer: (1) vertical and (2) lateral (Gagne & Smith, 1967). The integration of subskills into higher

level skills is vertical transfer. Thus, the trainee may learn and demonstrate several "subskills" during training. The ability to pull those together into a higher level skill and apply it to the job, is an example of vertical transfer. Applying the newly developed skills in the appropriate situations is lateral transfer. The cognitive skills necessary for vertical and lateral transfer may be incorporated into training, or may be conveyed and developed after training. Other aspects of transfer generalization include transfer distance (Laker, 1990), literal and figural transfer, and specific and non-specific transfer (Ford, 1990).

The job environment is always somewhat different from the training environment. A trainee may be able to focus on one primary task during training, but usually must balance multiple tasks as part of his job. Furthermore, upon returning to work, trainees may find they do not have the necessary time, resources, support, or opportunity to practice new skills (Ford, Quinones, Sego, & Sorra, 1992). Transfer Behavior reflects behavioral change given the various constraints or facilitators that may exist in the job environment. It requires not only that trainees have acquired the capability to perform the task differently, but also that they are motivated to apply their learning to the job, and have the resources to do so. In fact, several researchers have noted that when trainees lack conditional knowledge (i.e., knowing why they are learning something or the significance of the skill), their effort to maintain and generalize the skill quickly diminishes (Brown & Palinscar, 1982; Belmont & Butterfield, 1971; Kendall, Borkowski, & Cavanaugh, 1980). Conditional knowledge may be conferred during training, or may come later from the trainee's supervisor.

A training program may lead to trainee Learning and Training Performance, but due to constraints in the transfer environment, may fail to demonstrate Transfer Behavior changes. One could argue that, in that instance, the training was effective and was not the problem. However, when training is viewed in an organizational context (and not in isolation), we must conclude that training that does not transfer was not completely effective, and that interventions should be targeted to facilitate the transfer process.

Results/Organizational Effectiveness

This category is similar to Kirkpatrick's Results step. Results refer to *quantifiable changes in related outcomes as a result of trainees' behavioral changes*. For example, a trainee could return to his/her job and perform a particular machining task differently (Transfer Behavior), resulting in reduced waste (Results). However, it is possible that behavioral changes may

not yield changes in results, or may yield undesirable changes in results.

According to Kirkpatrick (1976), other examples of results are reduced grievances, increased quantity, reduced turnover (also noted by Horrigan, 1979), and reduced costs. Safety may be either a behavior or a result, depending upon how it is measured. Reber and Wallin (1984) used safety as a measure of behavior change by observing and recording the incidence of specific safety behaviors (e.g., wearing safety glasses). Alternatively, an examination of increases or decreases in the number of accidents would be a safety measure that corresponds to the Results criterion of training effectiveness.

What is implied by Kirkpatrick's Results category is that the appropriate results have been identified, and that the results are in fact related to Organizational Effectiveness. We want to make this assumption more explicit, since it has implications for the conclusions that are drawn regarding training effectiveness. If training is designed to be consistent with, and support the attainment of, organizational results, and these results are actually important to organizational effectiveness, then improvement in organization-level variables (as a function of training) can be expected.

On the other hand, if training is not properly linked to organizational objectives, or if desired results do not necessarily lead to improved organizational effectiveness, then training may have no impact on the "bottom line," or may actually reduce effectiveness. For example, if training has unduly shifted employees' attention away from critical aspects of their job toward less important aspects, we might see that changes in Behavior could lead to inappropriate changes in Results. Consider, for instance, a training course designed to enhance cleanliness aboard ship. Due to the training, trainees demonstrate changes in cleaning behaviors (Transfer Behavior) and cleanliness aboard ship improves (Results). However, the trainees now spend a disproportionate amount of their time focusing on cleaning behaviors, neglecting more critical aspects of their job; Organizational Effectiveness declines.

This is another example of how examining training in isolation can be misleading. In isolation, this training appears quite successful. But, examined in the larger organizational context, this training has deleterious effects. It is the entire training system (e.g., the mix of courses taken), as well as other human resource and company policies, programs, and experiences, that provide an individual with information about the appropriate weightings of job tasks.

The selection and measurement of relevant Results criteria should flow from a systematic training needs analysis, including an organizational analysis that explicitly considers organizational goals (Goldstein, 1993; Wexley & Latham, 1981). Training needs analysis can strengthen the link between Transfer Behavior and Results/Organizational Effectiveness by ensuring that the appropriate behaviors have been targeted for change. Bownas, Bosshardt, and Donnelly's (1985) and Ford and Wroten's (1984) research on content evaluation of training are good steps towards assessing and ensuring this match.

Assessing Results can be quite difficult for many types of training. As Kirkpatrick (1976) noted, "there are however so many complicating factors that it is extremely difficult, if not impossible, to evaluate certain kinds of programs in terms of their results. Therefore, it is recommended that training directors evaluate in terms of reactions, learning, and behaviors" (p. 21). In an interesting study, Russell, Terborg, & Powers (1984) measured the relationship between use of sales training (as measured by the percent of store personnel that received training and the perceptions of training emphasis) and evaluations of store performance. Their study is a rare example of using an organizational level performance measure in an attempt to assess training effectiveness.

A GAO study (June, 1986) addressed organizational-level measures of training performance for the military. They noted that the Department of Defense defines readiness as "the ability of forces, units, weapons systems or equipment to deliver the outputs for which they were designed (including the ability to deploy and employ without unacceptable delays)." Clearly, readiness could be a high level criterion for training effectiveness. Yet, the GAO reported, "Although a units' readiness is heavily influenced by the amount, type, and quality of training it receives, the services cannot determine precisely how readiness is affected by changes in the level of training activity" (p. 2). It is often difficult to assess training effectiveness in terms of Results/Organizational Effectiveness.

Relationship Among Training Outcomes

As Alliger and Janak (1989) noted, previous researchers and practitioners have made certain assumptions about the relationship among Kirkpatrick's levels of training effectiveness (see Hamblin, 1974). They have assumed that the levels are causally linked (e.g., reactions are causally linked to learning), and that the relationship among them is positive (i.e., positive reactions lead to better learning). In fact, Kirkpatrick's typology is sometimes referred to as a *hierarchy of training effectiveness* to reflect this assumed relationship.

As depicted in the framework (see Figure 1), it is hypothesized that the relationship among effectiveness components may not be this straight forward. Specifically, we believe that there is a direct link among several, but not all, of the training effectiveness measures, and suggest further that a number of variables may moderate these relationships. In particular, we hypothesize a hierarchical link from learning to training behavior, from training behavior to transfer behavior, and from transfer behavior to results/organizational effectiveness. This conceptual hierarchy is based on the following logic: learning is a prerequisite to training performance to the extent that training performance requires the use of knowledge acquired during training.

However, training performance has another prerequisite; trainees must possess the skills and abilities necessary to perform the trained behaviors. Thus, a trainee may be able to recite the appropriate strategies for dealing with an approaching aircraft, but when confronted in a simulation, may lack the composure or verbal skills needed to behave appropriately. Without learning what to do differently, changes in behavior are impossible. However, simply knowing what to do does not imply that the trainee can do it. In other words, learning is a necessary, but not sufficient, condition for behavior change to occur. Similar arguments could be made for the relationship between training performance and transfer behavior, and between transfer behavior and results. That is, if trainees cannot perform the trained skill under training conditions (i.e., maximum performance), it is unlikely that they will be able to perform them as part of their regular job duties. However, simply because they can demonstrate the behavior during training does not mean that they will use them on the job. Likewise, if trainees do not behave differently on the job, organizational results cannot improve. Additionally, all changes in behavior do not have a positive effect on results.

Previous research has not always confirmed the hierarchical relationships suggested here (See Alliger and Janak, 1989). There are three possible explanations for this failure. First, the proposed hierarchy may be invalid. However, some empirical support has been reported (e.g., Latham, Wexley, & Purcell, 1975), and the logic behind the hierarchy appears sound. Second, as we suggested, trainee accomplishment of a previous level may be a necessary, but not sufficient, condition for accomplishment on the next level. Different variables contribute to the attainment of each set of outcomes. Specifically, in some cases they act as moderators in the relationship among the criteria, and reduce the correlations among outcomes (e.g., supervisor support moderating the relationship between training performance and transfer behavior). Third, the failure of some studies to

support the hierarchy may be the result of the way in which training outcomes have typically been measured.

Measurement issues can complicate the interpretation of observed correlations between outcomes. It is not uncommon for organizations to employ learning measures, training performance measures, and transfer behavior measures that measure different training objectives, or that are not related to the training objectives at all. For example, in tactical decision making training, the learning measure could focus on appropriate responses to a particular type of air contact, the training performance measure could be a simulation that incorporates a wide range of behaviors (including responding to air contact, but not limited to it), and the transfer behavior measure could be a global, pre-post performance appraisal. In this case, the lack of a relationship between the different criteria is as much a measurement issue as a conceptual one. If (hypothetically) the learning measure assessed the same range of behaviors that the simulation assessed (i.e., was more comprehensive), we would expect to see a stronger relationship between them. Similarly, to the extent that the transfer behavior measure focused only on the trained behaviors (i.e., was more focused), we would expect a greater correlation with training performance.

This is not to suggest that training effectiveness measures should be developed to ensure overlapping content. In fact, there are practical reasons why outcomes measures could focus on different objectives (e.g., to ensure that the entire criterion space is properly assessed). Furthermore, organizational realities often preclude the collection of "ideal" training effectiveness measures (Tannenbaum & Woods, 1992). However, what we are suggesting is that there may be a difference between the "true" relationships among the effectiveness criteria and observed correlations based on the available measures during a given research study.

Overall, we hypothesize positive relationships among most of the outcomes. However, unlike Hamblin (1974), we do not hypothesize a link between reactions and learning. There is no logical, nor theoretical, foundation for suggesting that liking a training course should be related to objective measures of learning. In fact, a meta-analysis of training outcomes revealed low correlations between reactions and other training outcomes in previous research (Alliger & Janak, 1989). Alliger and Janak suggested that negative correlations between reactions and learning are possible, and that, "perhaps it is only when trainees are challenged to the point of experiencing the training as somewhat unpleasant that they learn." (p. 334).

On the other hand, some positive correlations have been reported as well (e.g., Eden & Shani, 1982). A possible explanation for this inconsistency is that reaction measures that assess the perceived relevance/utility of the training are positively related to learning, but measures that assess a trainee's general level of affect/happiness are not. Baumgartel and Jeanpierre (1972) found positive correlations between trainees' perceptions of value and self-reported behavior change, but not between hygiene reaction measures and self-reported behavior change. Unfortunately, most previous training studies did not measure training reactions as a multi-dimensional construct.

Since training reaction measures are such a prevalent form of training outcome, further research is needed to clarify the relationship between reactions and other measures. For example, Mathieu et al. (1992) found that reactions interacted with motivation to predict learning. It is important to understand the extent to which reaction measures are likely to be useful surrogates for other, more difficult-to-collect, training effectiveness indices. However, at this point, there is little evidence to suggest that reactions are related to other training outcomes.

From a pragmatic perspective, we agree with Goldstein (1980) concerning the need to use multiple criteria that reflect instructional objectives and organizational goals. Each type of outcome measure reveals something different about the effectiveness of the training, and thus, the appropriate focus of the evaluation should vary with the situation. In addition, we recognize that observed correlations will not always support the hypothesized connections among training criteria. Our model depicts the conceptual relationship among the criteria. Future research should examine the conditions under which the measures covary.

Now that we have addressed the issue of measuring training effectiveness, we turn to the other variables in the model and discuss their interrelationships and impact on training effectiveness.

VARIABLES IN THE TRAINING EFFECTIVENESS MODEL

Individual Characteristics

Individual characteristics are hypothesized to impact a number of variables throughout the model. First of all, trainees' abilities are hypothesized to influence learning and training performance. Non-ability factors (e.g., attitudes) are hypothesized to influence trainees' expectations, desires, and

pre- and post-training motivation. The following sections describe, in more detail, those individual characteristics that we believe are important to training effectiveness.

Ability. We use the term "ability" to refer to a range of capabilities, including: cognitive ability, physical ability, task specific abilities, and trainability.

1) **Cognitive Ability**. Many studies have examined the effects of cognitive ability in training environments. Neel and Dunn (1959) found a relationship between the Wonderlic test and course exam scores. Distefano, Pryer, and Crotty (1988) studied training for psychiatric aides. They found that two cognitive ability measures were predictive of performance on a training knowledge test. Drakeley, Herriot, and Jones (1988) reported a relationship between an intellectual aptitude battery (verbal, non-verbal, numeracy, speed and accuracy) and several training effectiveness measures, including professional marks (apparently a learning measure), and leadership ratings. However, they found no relationship between the measure and withdrawal from training.

Gladstone and Trimmer (1985) reported a relationship between the General Aptitude Test Battery (GATB), and training success for work incentive program participants. Taylor (1952) and Taylor and Tajen (1948) reported relationships between aptitude test batteries and scores on a training performance test. Gordon and Kleiman (1976) reported an effect for an intelligence measure and the sum of graded test exercises. Tubiana and Ben-Shakar (1982) noted the connection between an intelligence test and officers' ratings of potential at the conclusion of training. Mobley, Hand, Baker, and Meglino (1979) found a significant difference between recruit training graduates and those that failed to complete training on the AFQT (a form of scoring the Armed Service Vocational Aptitude Battery - ASVAB).

Fox, Taylor, and Caylor (1969) and McFann (1969) also reported a relationship between the AFQT and training effectiveness as measured by training time and passing training, respectively. Hogan and Hogan (1985) found the ASVAB to be unrelated to training completion for Navy divers. Allen, Hays, and Buffardi (1986) found that trainees scoring higher on the GRE analytic, and VPI intellectual exams, took longer to solve problems, but had fewer incorrect solutions. In a study of a more focused form of ability, Gopher (1982) reported a positive relationship between selective attention ability and completion of a two-year training program for Israeli flight cadets.

In general, the research summarized here suggests that trainees with greater ability will demonstrate better training performance and higher scores on learning measures. In a study

of military trainees, Ree and Earles (1991) reported that general cognitive ability ("g") was the best predictor of training success. This has important implications for selecting employees for training, particularly if training is costly and failure is possible. However, these studies do not allow us to conclude that higher ability people learn more in training.

Most of the studies cited above that addressed "learning," actually assessed academic performance or post-training knowledge levels, and not learning, per se. That is, the studies demonstrate that trainees who possess greater ability do better on performance and/or learning tests after training, but the studies do not indicate whether high ability individuals gained more from training than did low ability individuals. Learning implies a change or an improvement in knowledge as a result of training. It is likely that the higher ability people would have scored better on the knowledge tests even without training. Schmidt, Hunter, and Outerbridge (1986) suggest that cognitive ability should enable people to acquire job knowledge. Until recently, the premise that trainees with high cognitive ability learn or acquire more knowledge than others during training had not received a great deal of empirical attention in the training literature.

In one recent study, Bretz and Thompsett (1992) reported a significant effect for cognitive ability on post-training knowledge, after controlling for pre-training knowledge. However, in a similar sample in which pre-training knowledge could not be controlled for, the relationship between post-training knowledge and cognitive ability appeared to be even greater. In other words, cognitive ability was related to learning, but was a stronger predictor of post-training knowledge than of learning, per se.

Over the last several years, there has been continuing debate about the importance of cognitive ability, and whether certain abilities are more important at various points during skill acquisition (see Ackerman, 1989, 1992; Barrett, Caldwell, & Alexander, 1989; Fleishman & Mumford, 1989a, b; Henry & Hulin, 1987; Murphy, 1989). For example, Murphy (1989) suggests that cognitive ability is critical for learning and performing new or unfamiliar tasks, but less critical during stages when workers are performing well learned, familiar tasks. Ackerman (1988) found that ability has differential predictability at initial, intermediate, and asymptotic performance levels.

It seems logical that ability sets a limit on learning, particularly for complex tasks. If training is at a level beyond a person's ability, no learning will occur. Perhaps it is best to think of ability as resource capacity. If sufficient re-

sources exist, then learning can occur and other factors (e.g., motivation, competing tasks) will also influence the degree of learning. Kanfer and Ackerman (1989) expanded on the work of Kahneman (1973) and proposed a model of ability-motivation interactions. They suggest that individuals have a particular resource capacity level, and that motivational processes will influence personal allocation of those resources. The greater the attentional demands of the task, the greater the importance of cognitive ability.

Future research needs to assess the relative affects of cognitive ability and motivation on pre-post change measures of learning for various forms of training tasks. We would speculate that cognitive ability measures are often predictive of pre- or post-training learning measures, but that both learning motivation and ability are often predictive of pre-post change.

Abilities may also interact with training methods to influence training effectiveness. For example, Parker and Fleishman (1961) showed that structuring training procedures to match ability components required at each stage improved performance over that seen in two control groups. There is a body of literature that addresses aptitude treatment interactions (see Cronbach & Snow, 1977); this is discussed in the section on training methods.

2) **Physical Ability**. Two studies considered physical ability as a predictor of training effectiveness. Biersner, Ryman, and Rahe (1977) found that the physical fitness of divers was related to their successful completion of training. Hogan and Hogan (1985) found cardiovascular endurance, lifting strength, and muscular endurance test scores predicted completion of diving training and overall training performance.

Hogan (1991) created several tables that summarized a number of physical fitness and ability tests relating to job and training performance. These tables demonstrate that a variety of physical ability tests (grip strength, cable pull, dynamic leg/arm strength, sit-ups, step-up time, body density, balance, twist and touch), have been examined in relation to training performance (Reilly, Zedeck, & Tenopyr, 1979; Myers, Gebhardt, Price, & Fleishman, 1981).

In general, it can be concluded from these, and other studies, that components of physical ability are related to aspects of training performance (e.g., time to complete training). In particular, these studies suggest that for training with a strong physical component, such as underwater diver training, physical fitness is related to training performance. As with cognitive ability, this is important for

selecting trainees who are likely to pass training. As with any selection paradigm, it is important to identify the appropriate predictors that correspond to the performance criteria. Performance on training tasks with a perceptual ability component are likely to be predicted by perceptual ability tests, and so on. The taxonomic work of Fleishman and Quaintance (1984) is informative in this regard.

3) **Trainability**. Another group of researchers have studied task-specific abilities as predictors of training performance. They use performance on samples of the task to be trained or early performance trials as indications of trainability. "Trainability" is the ability to learn a given task. Robertson and Downs (1979) described the steps in administering a trainability test. First, potential trainees are briefly instructed on how to perform the task, and allowed to ask questions. Next, the prospect performs the task unaided and is evaluated on his/her performance. In a review of trainability studies, Robertson and Downs found that about 16% of the variance in trainee performance is attributable to ability.

For the most part, investigations of trainability have focused on tasks with a manual component, and have been conducted with greater frequency in Great Britain than in the United States. Several examples of these studies are noted here. Downs (1970) reported that performance on a training sample was related to final instructor ratings. Gordon (1955), and Gordon and Cohen (1973) showed that early training performance was related to subsequent radio code test scores. Smith and Downs (1975) demonstrated a relationship between trainability assessment and a job performance test three months after training, although the relationship diminished over 12 months. A recent meta-analysis showed a positive relationship between trainability test scores and various training and performance measures (Robertson & Downs, 1989). However, in general, trainability tests predict short-term training success better than long-term training success, or subsequent job performance.

In sum, trainability has been shown to be a useful predictor of training and job performance, particularly for manual jobs, and for short-term criteria. As with some of the other predictors, trainability measures are useful for selecting trainees in situations where training is costly or time consuming. However, they do not add much to our conceptual understanding of why training works. They tell us that people who are more capable of learning a relevant portion of the task will be more capable of learning the remainder of the task.

Self-Efficacy. As noted earlier, self-efficacy should be considered an important dependent variable because it has been

shown to be related to subsequent task performance (Barling & Beattie, 1983; Locke, Frederick, Lee, & Bobko, 1984; Taylor et al., 1984). Similarly, pre-training self-efficacy may be an important predictor of learning and training performance. Recently, Gist, Schwoerer, and Rosen (1989) demonstrated a connection between pre-training self-efficacy and subsequent training performance in computer software training. Results of this investigation revealed a Pearson r value = .31 between self-efficacy (as measured by a self-report questionnaire), and newly trained software skills (as measured by achievement tests performed on a computer which utilized the new software). On the basis of these results, Gist, et al. (1989) suggested that training benefits can be enhanced by first increasing self-efficacy via a pre-training intervention technique. Along this line, Eden and Ravid (1982) manipulated trainees' expectations of their performance by having a psychologist tell some military trainees that they had high success potential. They found that self-expectations of performance were related to subsequent trainee performance.

Obviously, the self-efficacy construct holds promise as a means to improve our understanding of the training effectiveness process. Future training research should incorporate self-efficacy measures when possible. In particular, if a relationship between pre-training self-efficacy and measures of training performance continues to be shown (i.e., trainees high in self-efficacy perform better), subsequent research should examine explicitly the organizational/situational factors that affect pre-training self-efficacy. Moreover, a relationship between self-efficacy and pre- and post-training motivation seems logical, although we found no research that addressed this connection directly.

Self-efficacy may also apply to training in other manners. For instance, Gist (1987) pointed out that low self-efficacy may indicate an area of employee training needs. That is, an employee's low self-efficacy regarding a specific skill may indicate a deficiency in training. This connection could be used both to plan future training, and to evaluate past training effectiveness (Gist, 1987). In addition, pre-training evaluation of self-efficacy would allow for the tailoring of training programs to specific employees. For instance, when working with low efficacy persons, utilizing enactive mastery and modeling techniques could lead to the most successful efficacy augmentation (Gist, 1987).

Attitudes. Trainees' work related attitudes can clearly affect their receptiveness to training. In particular, their level of commitment to the organization is likely to predispose them to view training as more or less useful, both to themselves

and to the organization. Organizational commitment is defined as "...the relative strength of an individual's identification with and involvement in a particular organization. Conceptually, it can be characterized by at least three factors: (1) a strong belief in, and acceptance of, the organization's goals and values; (2) a willingness to exert considerable effort on behalf of the organization; and (3) a strong desire to maintain membership in the organization" (Mowday, Porter, & Steers, 1982, p. 27).

Accordingly, it follows that current employees who are more committed to the organization would be more likely to: (1) perceive that training would be beneficial; (2) be willing to exert a great deal of effort in order to be successful in training; and (3) want to do well in training in order to solidify their position in the organization. Furthermore, Pierce and Dunham (1987) have found that new employees' propensity to become committed to the organization (i.e., as assessed on their first day of employment) exhibited significant positive correlations with job and role expectations, as well as their willingness to take on organizational responsibilities. Thus, we would expect that even new employees' organizational commitment levels would be related positively to their expectations concerning training, and to their motivation to learn.

Very little empirical research on commitment has been conducted within a training context. Mobley et al. (1979) found that a trainee's intention to remain with the military was related to completion of recruit training. Noe and Schmitt (1986) found that job involvement was related to learning, but not to behavior change or motivation to transfer. Additional research is needed which examines the influence of trainees' attitudes on training effectiveness.

Other trainee attitudes or dispositions that might affect training effectiveness include goal orientation (Dweck, 1986), cognitive playfulness (Martocchio & Webster, 1992), and individual values about learning.

Personality. Several studies have examined the connection between personality variables and training performance. In their review of individual differences in military training environments, Hogan, Arenson, and Salas (1987) identified some instances in which personality was related to training outcomes. Hogan and Hogan (1985) found that personality measures related to good adjustment, risk taking, and confidence were correlated with completion of training for Navy divers. Hoskin, Driskell, and Salas (1986) found that the Hogan Personality Inventory accounted for additional variance in Navy Basic Electricity and Electronics School performance over the ASVAB.

Ryman and Biersner (1975) demonstrated a relationship between conformity and training graduation. Neel and Dunn (1959) showed a connection between the "how supervise scale" and an authoritarianism measure with training course exam scores. Tubiana and Ben-Shakhar (1982) found a composite measure of personality and motivation to be related to officer ratings of trainee potential. Unfortunately, it is impossible to separate the personality effects from the motivation effects in that study. Other personality traits that may be relevant in the training context include openness to experience (Barrick & Mount, 1991), concentration, persistence, and self-confidence (French, 1973).

In contrast, Baumgartel and Jeanpierre (1972) found no relationship between a composite measure of personality and any training outcome factors. Miles (1965) reported no significant relationship between ego strength, flexibility, or need for affiliation with self- or peer-rated changes. Noe and Schmitt (1986) uncovered no connection between locus of control and measures of learning, motivation to transfer, or behavior change.

Overall, then, there is only mixed support for a direct connection between personality and training effectiveness. Perhaps stable personality traits operate through their influence on dynamic trainee characteristics (e.g., self-efficacy, expectations, or training motivation) to affect training outcomes. For example, Baumgartel, Reynolds, and Pathan (1984) reported a relationship between locus of control and need to achieve with self-reported effort to apply (i.e., post-training motivation). Furthermore, Mathieu, Martineau, and Tannenbaum (1993) found that need for achievement was directly related to the development of self-efficacy during training and, in turn, indirectly related to skill acquisition. We suggest that if personality variables are likely to affect training effectiveness, their influence will probably be indirect, through more dynamic trainee characteristics.

Experience. There is little support for the conclusion that experience directly influences training effectiveness. Miles (1965) and Fleishman (1953) reported no effect for tenure or number of subordinates supervised on training effectiveness. The latter may be considered a surrogate measure of "type of experience." Gordon, Cofer, and McCullough (1986) found seniority to be unrelated to time to complete training. They found previous job performance and inter-job similarity to be related to training completion time. However, those two variables are as easily considered measures of task-specific ability as they are experiences. Drakely et al. (1988) did find a relationship between a weighted application blank (typically they contain experiential information), and measures of learning

and withdrawal. With regard to experience with previous training, Cronbach and Snow (1977) did show effects for previous experience with instructional techniques.

In general, experience has not been found to be directly related to training effectiveness, except where it is a surrogate measure of task-specific ability. However, it is likely that experiences are useful predictors of training expectations, desires, motivation, and self-efficacy, although there has been no research examining those relationships.

Demographics. There is almost no evidence of any consistent relationship between demographics and measures of training effectiveness. Baumgartel and Jeanpierre (1972) found no effects for education or age. Baumgartel, Reynolds, and Pathan (1984) reported no significance for rank/job level. Fleishman (1953) found no effect for age or education. Tubiana and Ben-Shakar (1982) reported a relationship between education and ratings of potential. As with personality and experience, if demographics are likely to affect training effectiveness, it would be indirectly through their relationship with expectations and desires.

Organizational/Situational Variables

The context in which the training system is embedded can be a critical determinant of training effectiveness. Organizational and situational variables may influence variables in the training model both before and after training. The sections that follow summarize what we believe are the most crucial organizational and situational variables that impact training effectiveness.

Pre-training. Prior to training, organizational and situational factors should have a direct influence on training expectations, desires, and training motivation. Subsequently, they will have an indirect effect on training effectiveness. Organizational culture, history, and policies can shape trainees' expectations about training. For example, Eddy, Glad, and Wilkins (1967) found that students from supportive, cohesive agencies expressed higher degrees of interest in course structure and traditional academic approaches to knowledge than those from less cohesive and supportive agencies. Weiss (1978) found that subordinates tend to adopt the work values of their immediate superiors.

Trainees look to their work environment for answers to many questions: Does training matter in this organization? Does the organization develop its people and promote from within? Have management and labor had problems? Has training been provided as a punishment for poor performance or as a reward for good per-

formance? Have successful people in the organization gone to similar training courses? Answers to these questions could shape employees' beliefs about the utility of training, including perceptions regarding the instrumentality of training for attaining desired outcomes--a key component of training motivation.

For example, there is some evidence that the messages trainees receive can influence training effectiveness. Martocchio (1992) manipulated trainee perceptions about the usefulness of training in their organization by providing different instructions at the beginning of training. One group was informed that computer training was an "opportunity" and was told about the potential benefits and gains associated with the training. The second group was provided neutral information about the general objectives of the training. All trainees received identical training but the group that was lead to believe that the training was valuable demonstrated greater post-training knowledge and efficacy, and lower computer anxiety than the group that received a neutral message. Apparently, the signals trainees receive about training can affect their readiness to learn.

1) **Supervisors**. Supervisors may be a primary influence of trainee expectations and motivation through the signals and messages they send. The message conveyed by superiors may be direct or subtle. In an example of a direct message, Kaufman (1974) found that immediate supervisors discouraged their subordinates from taking classes because it might divert time and effort away from their job assignments. Alternatively, Huczynski and Louis (1980) noted that trainees who had a pre-training discussion with their boss reported greater attempts to transfer what they learned. Similarly, Cohen (1990) found that trainees with more supportive supervisors entered training with stronger beliefs that training would be useful. Supervisors can show their support for training by helping employees establish training goals (Cohen, 1990), informing trainees that there will be post-training follow-up or assessment (Baldwin & Magjuka, in press), providing release time to prepare for training, and having their work covered while they are in training (Lee, 1992).

2) **Constraints**. Other cues in the pre-training environment can also affect training effectiveness. Mathieu et al. (1992) found that trainees who perceived many constraints on their environment entered training with lower motivation to learn. Apparently trainees felt they would not be able to apply what they were about to learn, so their belief in the instrumentality of training was adversely effected. This suggests that one method for enhancing training effectiveness is to identify and eliminate obstacles in the work environment prior to conducting training.

3) **Notification.** The manner in which trainees are selected and notified of training can also influence expectations and motivation. Baldwin and Magjuka (in press) reported that trainees who had received information about the training ahead of time, reported a greater intention to apply what they learned when they returned to the job, than trainees who received no prior information. Alderfer, Alderfer, Bell, and Jones (1992) found that trainees who received more information prior to training had more positive reactions at the conclusion of the training. Hicks and Klimoski (1987) and Martocchio (1992) both showed that the nature of the information provided to trainees prior to training can influence trainee attitudes. For example, Hicks and Klimoski (1987) found that trainees who received a realistic description of the training reported more motivation to learn than those who received a traditional, positive portrayal of the training. However, they did not find differences in actual learning.

As noted earlier, Martocchio (1992) found that information emphasizing the payoffs associated with training improved subsequent learning. In combination, these two studies suggest that trainees should be provided with information about the value and usefulness of the training, but only if that information is consistent with organizational reality. In addition, it may be useful to provide realistic information about the difficulty, or rigor of the training to help trainees develop appropriate expectations. In general, it appears that providing trainees with advance notification may be helpful, but it is not clear whether such notification enhances feelings of involvement, creates realistic expectations, heightens motivation, or allows time for trainees to align their personal goals with the training goals (Tannenbaum & Yukl, 1992).

4) **Trainee Choice.** Another important contextual factor that may influence training effectiveness is whether trainees can choose which training they attend. In some instances, voluntary participation has been shown to be related to higher motivation to learn, greater learning, increased self-efficacy, and more positive trainee reactions than mandatory attendance (Cohen, 1990; Hicks & Klimoski, 1987; Mathieu, et al., 1990; Mathieu et al., 1993). In contrast, Baldwin and Magjuka (in press) found that engineers who perceived training to be mandatory reported greater intentions to apply what they learned than did engineers who viewed their attendance as voluntary. Tannenbaum and Yukl (1992) speculated that when training is not highly valued in the organization, mandatory attendance may be demoralizing. But when trainees' previous training experiences have been positive, mandatory attendance signals to employees which training courses are considered most important by the organization.

Baldwin, Magjuka, and Loher (1991) showed that soliciting trainees' input as to which training they want to attend can enhance motivation - if they are allowed to attend their training of choice. However, soliciting input can backfire. Baldwin et al. (1991) found that trainees who were asked to specify training preferences, but were subsequently assigned to a different type of training, exhibited lower motivation to learn than those trainees who were not asked for their preferences at all.

We would also hypothesize that the purpose of the training could influence motivation and expectations. Research is needed that examines expectation and motivational differences between trainees sent to training to improve their current skills, to develop new skills for their current job, to certify their existing skills, or to prepare for subsequent career moves.

In addition, there may be differences in trainee motivation based on task or job characteristics. Employees training for jobs with greater task identity and significance may be more motivated to learn than those from jobs with lower task characteristics scores (e.g., as based on the Job Descriptive Index).

Post-training. After training, organizational/situational variables are hypothesized to influence trainees' motivation to transfer what they learned, and influence their subsequent job performance. Factors such as transfer climate and supervisor support are hypothesized to affect motivation, while resource availability is hypothesized to influence job performance directly.

Baumgartel and Jeanpierre (1972), and Baumgartel et al. (1984) found that employees' perceptions of transfer climate were related to effort to apply training. Trainees who reported that their transfer environment had a high appreciation for performance and innovation, encouraged risk taking, and allowed freedom to set goals, also reported greater effort to apply their training.

Hand, Richards, and Slocum (1973) found that trainees who perceived their organizations as favoring participation by subordinates, innovative behavior, and independence of thought, reported greater behavioral and attitudinal changes. The effect was non-significant after three months, but apparently grew stronger with time, and was significant 18 months after training. Miles (1965) also found that perceptions of the transfer environment (i.e., security, autonomy, power, and problem solving adequacy) were related to perceived change on the job. Huczynski and Louis (1980) found supervisor support (i.e., style and attitude) to be the strongest predictor of self-rated attempts at transfer. Trainees also reported that transfer was inhibited by

work overload, crisis work, and a failure to convince older workers.

Several recent studies confirmed the importance of the work environment and improved upon earlier research by closely examining transfer behaviors. Rouillier and Goldstein (1991) hypothesized that a set of situational cues and consequences in the post-training work environment (i.e., "transfer climate"), would contribute to positive behavioral transfer. They examined the effect of these cues and consequences with a sample of managers who completed training and were then randomly assigned to one of 102 organizational units. Rouillier and Goldstein found that, in units with more positive transfer climate, trainees demonstrated significantly more trained behaviors, even after controlling for learning and unit performance. Tracey, Tannenbaum, and Kavanagh (1993) replicated and extended the research by Rouillier and Goldstein. Consistent with Rouillier and Goldstein (1991), they showed that positive training climate contributed to post-training behavior, even after controlling for learning and pre-training behavior. In addition, they demonstrated that managers who returned to units that shared a common belief in the importance of continuous learning (i.e., a "continuous learning culture"), also demonstrated better behavioral transfer.

As with the pre-training environment, situational constraints can inhibit transfer in the post-training environment as well. Peters and O'Connor (1980) and Peters, O'Connor, and Eulberg (1985) examined a variety of situational constraints to work outcomes. Peters et al. (1985) conducted a literature review of empirical studies and identified several classes of situational constraints. While their work did not focus on a training context per se, their findings are applicable to the transfer of training situation. Specifically, several constraints should influence job performance directly, including: poor time availability; shortages or inappropriate resources (e.g., tools, equipment, materials, supplies); lack of required services from others; a poor physical work environment; and a lack of job relevant authority. Without these, a trained employee who wants to perform his/her job differently would not be able to do so. Ford et al. (1992) showed that, upon completion of training, employees will face differential opportunities to practice and apply what they have learned. Employees who receive no opportunity will not be able to transfer what they learned, and their new skills will likely atrophy over time.

Alternatively, situational constraints may not be severe enough to preclude transfer entirely, but they might make transfer difficult enough to discourage the employee. Situational

constraints can reduce trainees' perceptions that effort leads to performance, and thus, may reduce motivation to try. Schoorman and Schneider's (1988) book on constraints and facilitators provides numerous illustrations of how situational factors influence work effectiveness.

A recent study has shown that situational constraints can operate at different levels to affect training outcomes. For example, Mathieu et al. (1993) showed that individual constraints on a trainee's schedule outside of training can directly inhibit the development of self-efficacy during training, foster negative reactions to training, and indirectly attenuate skill acquisition. This has important implications for training effectiveness because it illustrates that activities outside of training can influence learning and reactions to training. Organizations that respond solely to trainee reactions may make fruitless "improvements" to a training program if the actual source of discontent lies outside the training context (Mathieu et al., 1993).

The literature on situational constraints also supports the research on organizational climate regarding the role of supervisor and peer support. For example, Peters et al. (1985) noted problems with a lack of support from superiors or peers after training. A trainee can return to the job with new skills, but through a lack of reinforcement, or coaching or modeling, may lose his/her motivation to apply those new skills (Robinson & Robinson, 1985). On-going, post-training feedback may be necessary to improve and maintain performance (Komaki, Heinzmann, & Lawson, 1980). Michalak (1981) reported that managers from offices that exhibited on-going transfer of training met with their employees (i.e., the trainees) after training, and announced changes as a result of training. Managers from the offices with poorer transfer used no follow-up procedures with their returning employees. Some specific maintenance interventions are discussed later in this report.

Finally, Morrison and Brantner (1992) studied how well people learn their job, independent of training. In a study of 600+ mid-level Navy officers, they found that leadership climate, peer and subordinate competence, and time availability for professional development were all related to how well the officers learned their jobs. In summary, it appears that the work environment plays an important role in creating a context in which individuals can learn, as well as apply, what they have learned in training. Further research is needed that identifies and examines the organizational and situational factors that inhibit or facilitate trainees' use of newly trained skills.

Expectations/Desires

As a result of their individual characteristics, as well as their previous experiences, both within and outside of their organization, individuals enter training with differing expectations and desires regarding training. These cognitions appear to play a central role in determining training effectiveness. Hoiberg and Berry (1978) reported that discharged military recruit trainees were more likely to have expected training to emphasize innovative training methods, and to minimize importance of control, involvement, and efficiency, than were successful trainees. The discharged trainees probably had unrealistic expectations about the recruit training environment (Bourne, 1967).

Other researchers have also found expectations to be related to training effectiveness. Ryman and Biersner (1975) found that course expectations were positively related to graduation, and that training concerns were negatively related. Lefkowitz (1970) found a relationship between more realistic expectations of trainees, and subsequent performance in training, and on the job. Hicks and Klimoski (1987) manipulated trainees' expectations through pre-training notifications. They found that those who received realistic notices had greater motivation to learn, greater commitment to attend, and reported that the workshop was more appropriate and profitable. Martocchio (1992) also manipulated trainee expectations. He found that trainee expectations were related to how much they learned during training. Eden (1990), in summarizing the research on Pygmallion effects, concluded that trainee achievement can be greatly enhanced by increasing trainees' performance expectations. On the other hand, negative expectations regarding training can be an obstacle to implementing re-training efforts (National Association of Broadcasters, 1987).

In the turnover literature, expectations have been studied from two perspectives. One deals with unrealistic expectations (e.g., Wanous, 1977), and suggests that unrealistic expectations should be related to dissatisfaction and turnover. Typically, lower expectations are assumed to be more realistic. This approach has only mixed support, and the effect of realism on turnover is weak at best (Louis, 1980).

An alternative viewpoint on expectations deals with <u>unmet</u> expectations. This approach operationalizes unmet expectations as the discrepancy between initial expectations (or needs/desires) and actual experiences or perceptions (cf., Dunnette, Arvey, & Banas, 1973; Insel & Moos, 1974). In several studies (Dunnette, et al., 1973; Katzell, 1968; Ross & Zander, 1957), dissatisfaction and voluntary turnover were related to unmet

expectations, and not to initial expectation levels. To the extent that higher expectations are unrealistic and are subsequently unfulfilled, the two approaches are similar. However, when the two approaches do not converge, the "met expectations" approach appears to be more useful.

The turnover research has important implications for training effectiveness. As noted earlier, trainees enter training with different expectations and desires. We will use the term training fulfillment to refer to the *extent to which training meets trainees' expectations and desires*. When training fails to meet trainees' expectations and desires, or training fulfillment is low, we would hypothesize some dysfunctional outcomes. Negative attitude change, poor training reactions, and failure to complete training could be the results of low training fulfillment. In fact, Hoiberg and Berry (1978) found that discrepancies between actual and expected training conditions accounted for additional variance in Navy technical school graduation, beyond that accounted for by initial expectations. However, we found no other training research that examined the effects of training fulfillment.

Future research should examine the relative effects of training fulfillment on training effectiveness in conjunction with the other relevant variables in the model. In addition, "surprisingly little attention has been given to how the point of view of employees relates to expectations, attitudes, or decisions to select training programs" (Hicks & Klimoski, 1987, p. 542). However, at least one such study has been completed that deals with self-efficacy (i.e., expectations an individual holds regarding his/her ability to complete a task). Specifically, Hill et al. (1987) examined efficacy expectations in relation to decisions to use computers and decisions to enroll in computer courses. The study revealed that computer self-efficacy predicted behavior intentions, and behavior intentions predicted enrollment in courses. People who believed they could not control computers (i.e., had low expectations regarding their potential performance) did not sign up for the computer course.

Gist (1987) noted, in this regard, that an individual with low self-efficacy, expecting not to perform well in a training situation, will be prone to avoid the training programs. On the other hand, an individual with high efficacy will be more likely to voluntarily attend training (Gist 1987). There is some evidence of individual differences in self-reported training needs (Ford & Noe, 1987), but little or no research has examined the antecedents of expectations and desires (e.g., organizational and/or situational factors, personality, or demographics).

Overall, there is a need for research that addresses questions such as: how are training expectations formed?; and what is the role of co-workers and supervisors in forming such expectations? For example, Gist (1987) recognized persuasion as a significant piece of efficacy information. Successful persuasion characteristics include a credible and expert source, consensus among multiple sources, and a source familiar with task demands (Bandura, 1986). Gist (1987) proposed that a supervisor's high expectations might be regarded as persuasive input to employee self-efficacy. Thus, a positive pre-training meeting may factor into both increased self-efficacy and increased trainee course expectation (Gist, 1987). Both results, in turn, may factor into increased training benefit. More research in this area is needed.

Future research should also recognize, explicitly, that training expectations and desires are not necessarily identical. Some training expectations are negative (e.g., I expect that the training will require us to complete peer assessments, but I hope not). This must be reflected in the derivation of *expectation fulfillment indices* as done here. In this way, it is possible to reflect accurately, not only what a trainee expects to happen, but also what he/she would like to happen.

Training Motivation

Motivation refers to the direction of attentional effort, the intensity of effort, and the persistence of that effort (Kanfer & Ackerman, 1989). Training motivation is a central variable in our model of training effectiveness. It operates throughout the model; before, during, and after training. Prior to training, potential trainees may be able to decide whether to attend training, or which training to attend. At that point, motivation to attend is crucial. As they enter training, and during training, trainees will display different degrees of motivation to learn. Finally, after training, for transfer to occur, trainees need motivation to apply and maintain any new skills they may have acquired during training. Training motivation is hypothesized to influence learning directly, training performance indirectly, and to moderate the relationship between training performance and subsequent job performance.

Conceptually, expectancy theory may provide a useful framework for examining training motivation (see Lawler, 1973 and Vroom, 1964, for detail on expectancy theory). In the training context, expectancy theory would suggest that trainees consider the utility of the training in attaining desired outcomes. Trainees consider this in deciding whether to attend training, to expend effort to learn, and to persist in attempting to apply what they have learned.

More specifically, training motivation can incorporate several components. Trainees can consider whether their effort in training will lead to successful training performance, incorporating questions such as: will successful performance in training lead to improvements in their subsequent job performance?; will job performance yield certain outcomes?; and how desirable are those outcomes?

Trainees' motivational focus may be slightly different at different points in the process. Prior to training, trainees may decide whether to participate in training, and how much effort to expend. The trainee may consider whether simply attending training is viewed positively or negatively in the organization --regardless of his/her effort and performance during training. He/She may also consider whether learning, and then applying the training, will lead to desired outcomes down the road. Kanfer and Ackerman (1989) would refer to this as a distal motivational process. It is prior to task engagement and does not draw attention away from the learning task. As noted earlier, it appears that the manner in which trainees find out about a course, and their degree of choice, can influence training motivation (Hicks & Klimoski, 1987; Huczynski & Louis, 1980). Research is needed that further clarifies why trainees choose to attend, and what influences their motivation to learn, prior to entering training.

During training, the trainees may consider whether they can learn the material in the course. If they feel they cannot learn it (i.e., the link between effort and learning or training performance is zero), they will not be motivated to learn. This link is similar to the concept of self-efficacy. Trainees may also consider whether the material being trained is relevant to their job. If they learn it, will it subsequently improve their job performance (i.e., what is the link between training performance and job performance)?

After training, trainees will have to decide whether or not to put effort into: (1) applying what they have learned, and (2) continuing to use newly acquired skills. In addition to their previous considerations, they are likely to consider whether applying what they learned will improve their job performance, and whether those improvements will lead to desired outcomes (e.g., promotion, pay increase, recognition). As Noe (1986) proposed, "motivation to transfer" measures could include items that assess the trainees' confidence in using their new skills and their belief in the applicability of using them. Naturally, a variety of factors before, during, and after training can influence trainee motivation; these are discussed throughout this report.

Despite the centrality of motivation to most conceptions of performance, there has not been a great deal of research examining the role of trainee motivation in training effectiveness until recently. In particular, there have been a number of studies that have shown that training motivation is related to trainee reactions (e.g., Mathieu et al., 1992; Tannenbaum et al., 1991), learning (e.g., Baldwin et al., 1991; Clark, 1990; Hicks, 1984; Mathieu et al., 1992), performance/transfer (e.g., Baldwin et al., 1991; Facteau, Dobbins, Russell, Ladd, & Kudisch, 1992; Ralls & Klein, 1991), and completion of training (Biersner et al., 1977; Mobley et al., 1979).

In contrast, Noe and Schmitt (1986) found no relationship between pre-training motivation to learn, and post-training learning, behavior change, or motivation to transfer. Unfortunately, a small sample size and some psychometric problems required them to collapse motivation, expectation, and situational variables together. Their resulting motivation measures are difficult to interpret.

Measures of motivation based on expectancy theory have been used successfully in non-training settings (e.g., Mitchell & Albright, 1972), although some concerns exist regarding their use. However, limited research suggests that they may prove useful in the training context (Mobley et al, 1979; Mathieu et al., 1992). Subscales could be developed that focus on motivation to attend, motivation to learn, and motivation to apply. Alternatively, an overall training motivation composite measure could be used. If so, it should reflect the perceived utility of the training to the trainee. It should represent the trainees' perception that training leads to valued outcomes, and stems from increases in job performance attributable to training.

The recent research on training motivation is encouraging; it is helping to bridge an unfortunate gap in our understanding of training effectiveness. Future research should address the measurement issues associated with training motivation, including a consideration of longitudinal data collection. In addition, research is needed that clarifies the impact of trainee motivation on training effectiveness, both as a main effect, and as an interaction with variables such as ability and task complexity.

Training Program Characteristics

We do not attempt to provide a comprehensive review of the research related to training factors, but instead will highlight a few salient issues. As noted in our model, a training needs analysis should evaluate individual, organizational, and task factors, and should drive subsequent training design. To the

extent that the training needs analysis accurately identifies needs, the link between job performance and results/organizational effectiveness should be strong. That is, if the needs analysis is accurate, performance changes that occur due to training should contribute to organizational effectiveness. We identified no research that examined the impact of various methods of identifying training needs on training effectiveness.

There is a growing body of research that has examined the effectiveness of various training methods, processes, and techniques. Carroll, Paine, and Ivancevich (1972) compared training directors' ratings and empirical research findings regarding a variety of training methods (e.g., business games, case studies, programmed instruction, lecture) and identified differences. A recent meta-analysis of managerial training (Burke & Day, 1986) found differences in the effectiveness for different training content (e.g., motivation training, human relations, decision-making) and different training methods (e.g., lecture, behavior modeling, group discussion). In particular, behavior modeling has demonstrated good success as a training method (Latham & Saari, 1979; Burke & Day, 1986; Gist et al., 1989; Baldwin, 1992).

A variety of training principles have been proposed and researched. Baldwin and Ford (1988), in their review of transfer of training, examined several training principles, including sequencing, practice, fidelity, and the use of identical elements. The use of training principles can influence training effectiveness. Allen et al. (1986) reported significant effects on training performance based on simulator fidelity. Swezey, Perez, and Allen (1988) found that opportunity for practice was related to training performance. Briggs and Waters (1958) reported an effect for subtask or component interaction, and Briggs and Naylor (1962) demonstrated an effect for part versus whole task training. Wightman and Sistrunk (1987) reported a chaining effect in their research. Kyllonen and Alluisi (1986) discuss a variety of ISD and learning strategy principles designed to enhance training effectiveness.

Feedback has been shown to improve performance (Katzell & Guzzo, 1983). Feedback can reinforce positive performance, and is necessary to correct negative performance. It can reveal to trainees the gap between desired and actual performance, and can highlight the utility of training in reaching the desired level. Thus, feedback can have a positive effect on training motivation. Komacki, Heinzemann, and Lawson (1980) and Reber and Wallin (1984) demonstrated that reinforcing feedback was related to subsequent behavior in a safety training research study. Miles (1965) found that feedback was related to self- and peer-rated behavior change.

Bahn (1973) and Kaman (1985) have argued that instructor characteristics can have an impact on training effectiveness. It seems logical that instructor style and preparation can influence trainee motivation and learning. In an interesting test of the Pygmalion effect, Eden and Shani (1982) induced instructors to expect better performance from some of the trainees. Results indicated that the trainees for whom instructors were led to expect higher performance actually did perform better on objective learning measures. Clearly, the instructors were able to have an impact on the learning of the trainees. Instructors may also highlight the utility of learning to trainees, enhancing trainees' perceptions that effort can lead to performance, and that performance can lead to desired outcomes. (Eden, 1990).

As mentioned earlier, Eden (1990) maintained that trainee achievement can be enhanced considerably by increasing trainees' performance expectations. Adding this to the above context, instructors who expect trainees to perform well will enhance the trainees' own expectations regarding their respective performance which, in turn, leads to higher performance.

Another factor to consider regarding training is the recent influence of cognitive psychology. Specifically, Tannenbaum and Yukl (1992) acknowledge the growing cognitive trend in the training field. As technological changes demand that humans and organizations perform increasingly complex tasks, the significance and potential utility of cognitive learning models will continue to grow (Tannenbaum & Yukl 1992). Of particular interest is how humans acquire and maintain complex, higher-order skills such as problem solving and decision making.

One of the implications of the cognitive psychology literature in training is the recommendation to incorporate meta-cognition skills into training. Meta-cognition "involves an awareness of the mental processes and strategies required for the performance of any cognitive endeavor." (Cassidy-Schmitt & Newby, 1986, p. 29). In this regard, Dansereau (1978) suggested that providing the learner with a general strategy for controlling intellectual processing, that is, for regulating the thought process during performance will enhance effectiveness. Other researchers believe that general strategic thinking cannot be trained successfully, and therefore, favor providing task-specific strategies; the assumption being that such information will transfer to broader, but similar areas (Cassidy-Schmitt & Newby, 1986; Gagne, 1985).

Kanfer and Ackerman (1989) have recently focused attention on certain cognitions that can occur during training (e.g., self-regulation, self-feedback). These cognitions are thought to be part of the proximal motivation process, and can determine the

distribution of trainees' effort to the training task. For example, whereas some learners intuitively understand such things as the significance and utility of trained skills or strategies without explicit instruction, this does not appear to be a developmental skill--that is, it does not necessarily increase with age (Brown, 1980). Therefore, instructors may be able to enhance trainees' motivation to transfer acquired skills by providing conditional knowledge, or knowledge of why the new skill is significant and when it can be used.

Overall, there is growing support for the applicability of meta-cognitive skills (e.g., providing conditional knowledge during training) for enhancing the learning process (Cassidy-Schmitt & Newby, 1986). This is particularly true for higher-order tasks, or tasks which are stressful (i.e., that require the trainee to perform in the face of difficult operational conditions) (Cannon-Bowers, Salas & Grossman, 1991).

The mental model construct, also popular in the cognitive psychology literature of late, may also factor into training system design. A "mental model," as defined by Rouse and Morris (1986), is a "mechanism whereby humans generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states" (p. 360). Mental models arrange information into structured patterns. This organization promotes rapid and flexible information processing which, in turn, facilitates access of related material. Utilizing mental models allows classification and retrieval of information about situations, objects, and environments to be accomplished in terms of most important features. This technique is particularly beneficial when circumstances demand rapid comprehension and response (Cannon-Bowers, Salas & Converse, 1993).

Recently, Cannon-Bowers et al. (1993) summarized the implications of mental model research for training system design. Among other things, these authors concluded that: (1) presenting explicit conceptual models of the system to be trained can enhance learning; (2) training is most effective when it includes specific information regarding the procedures involved with a task (in addition to presentation of a conceptual model); (3) unguided practice or experience does not guarantee development of complete, accurate mental models of the task; and (4) pre-existing mental models affect the trainee's ability to acquire new knowledge. In addition, developing a mental model of the overall system function, and the role of individual actions in the system, can help to demonstrate the significance of developing the new skill. That is, a well constructed mental model could help trainees understand the impact of utilizing

newly acquired skills on both sub-tasks or systems, as well as on the overall task or systems.

Several researchers have recognized the mental model construct as a valuable tool in evaluating an operator's knowledge of complex system performance, and as a foundation for analyzing effective and ineffective performance (Jagacinski & Miller 1978; Rouse & Morris 1986; Young 1983). In this regard, mental model theory helps explain how operators can adapt to changing conditions, sequence task inputs, and recognize the impact of a single behavior on the overall system. Further, Rouse and Morris (1986) argue that the most worthwhile use of the mental model construct may be incorporating it into solutions to applied problems such as developing training strategies.

Several other training factors are also related to training effectiveness, and to a trainee's motivation to learn and perform. For example, goal-setting theory states that an individual's conscious goals or intentions regulate his/her behavior. Goal-setting techniques can increase motivation, and have demonstrated increases in employee performance in a variety of settings (Latham & Yukl, 1975). Goal-setting has been incorporated into training with positive results (cf., Wexley & Baldwin, 1986; Wexley & Nemeroff, 1975).

Wexley and Latham (1981) note that the research on goal theory has three implications for motivating trainees. First, learning objectives should be conveyed clearly at the beginning of training, and at key points throughout. Second, training goals should be difficult enough so that trainees are adequately challenged, but not so difficult that they are unattainable. Third, the final goal, finishing training, should be supplemented with periodic subgoals throughout training.

Goals set during training that are related to training objectives may enhance learning and training performance. Goals that are established for the transfer environment may help subsequent job performance. The latter is discussed in the section on maintenance interventions.

Dweck (1986) expanded this goal theme with a reexamination of the affect of motivational processes on learning. Looking at motivation regarding achievement, typical goals divide into two categories: learning goals (increase competence) versus performance goals (receive approval, avoid disapproval) (Dweck & Elliot, 1983). Dweck (1986) divided motivational processes to parallel these goals. First, adaptive processes are attempts to encounter challenging learning situations that will potentially increase personal skills and knowledge. Conversely, maladaptive processes are avoidance of challenging situations and preference

for situations in which success was previously achieved (Dweck, 1986). Dweck proposed that these two different types of motivation affect a child's ability to exhibit current skills and knowledge, his/her ability to develop new skills and knowledge, and his/her ability to transfer the newly developed skills and knowledge to unfamiliar circumstances. Thus, motivational factors may be a significant influence in the use and development of natural aptitudes (Dweck, 1986).

In another line of thinking, some researchers have argued that various training factors interact with trainee aptitudes in determining training effectiveness. These are referred to as aptitude-training interactions (ATIs). For example, the value of practice, pacing, format, and other characteristics may vary according to individual differences. The most thorough explication of this concept is seen in Cronbach and Snow (1977).

Several empirical examples of ATIs appear in the literature. Wightman and Sistrunk (1987) reported that certain types of training methods were particularly advantageous for low aptitude trainees. Gist et al. (1989) noted a self-efficacy by training type (behavior modeling versus tutorial) interaction in their research. Buffardi and Allen (1986) found that low ability subjects needed greater simulator fidelity. That is, the relationship between simulator fidelity and training performance was moderated by analytical and mechanical ability.

Snow and Lohman (1984) suggested that highly able learners thrive on abstract instruction, while less able learners may be best trained by highly structured, concrete demonstrations. Unfortunately, we have not seen consistent ATI patterns as suggested by Snow and Lohman. Nonetheless, we believe that aptitude training interactions are still a fruitful area for research and may be useful for better understanding why training is effective or ineffective.

The training task may also moderate the relationship between variables in the model. For example, task difficulty, complexity and type may moderate the relationship between cognitive ability or motivation and training outcomes. Kanfer and Ackerman (1989) suggest that, "the contribution of ability and motivation factors to task performance depends on the attentional demands imposed by the task" (p. 660). The greater the attentional demands of the training task, the greater the importance of "G" or general intelligence.

Maintenance Interventions

Baldwin and Ford (1988) noted that transfer of training to the job includes both the generalization of learned material to

the job as well as the maintenance of trained skills over a period of time on the job. Several researchers have developed and/or tested specific interventions designed to enhance the transfer process. In our model, these are hypothesized to heighten motivation to apply and maintain new skills.

Marx (1982) proposed a relapse prevention model to maintain skills developed during managerial training. His approach consists of both cognitive and behavioral aspects. It is based on identifying when relapses may occur (i.e., reversions to pre-training behaviors) and developing strategies to deal with them.

Decker (1982) incorporated retention processes based on behavior modeling training into one training condition, and compared this to one in which trainees received the training without the retention processes. He found no differences in training reactions. However, supervisors in the experimental condition generalized learning to a novel situation better than supervisors in the control group. This replicated results from his previous lab study (Decker, 1980).

Wexley and Baldwin (1986) compared three strategies for facilitating positive transfer of training, including: (1) assigned goal-setting; (2) participative goal-setting; and (3) a behavior self-management program based on the relapse prevention model. They found the assigned goal-setting condition demonstrated greater learning than other conditions. Both goal setting conditions had better self-evaluated behavior change than either the relapse prevention, or control conditions. As in our discussion of training methods, it appears that goal-setting may be useful in facilitating behavior change.

The initial research on specific post-training strategies to facilitate transfer is encouraging. The importance of post-training events on training effectiveness cannot be overestimated, and any additional work that clarifies the transfer process should prove extremely useful.

LONGITUDINAL FIELD INVESTIGATION: NAVY RECRUIT TRAINING

An empirical data collection effort was conducted to begin to test key variables in the model of training effectiveness shown in Figure 1. Specifically, we had two purposes in mind: (1) to identify or develop scales to measure key variables in the model, assessing their psychometric qualities and providing suggestions for their future use, and (2) to perform an initial test of key constructs and relationships from the training effectiveness model in a longitudinal field training environment, assessing the potential value of the model for improving our understanding of training effectiveness.

Our literature review identified a large number of variables that may be related to training effectiveness. It was impossible to design an experiment that could measure all the variables and their interrelationships. This can only be accomplished over time, through a programmatic effort of research with successive studies, building on the findings from previous studies. Therefore, for this investigation, we sampled some of the central variables from major categories within the model. A variety of individual, motivation, expectation, and training effectiveness variables were included. Some of the variables selected have shown promise in the previous research, while others have yet to be tested sufficiently. Most of them have not been tested in such a way as to assess their relative impact on training effectiveness. The current investigation allowed for that assessment.

In particular, this investigation focused on motivation, self-efficacy, and expectation variables. There have been no research studies that have simultaneously examined these variables in such a way as to assess their relative impact on training effectiveness. The most expansive related research effort to date was work by Noe and Schmitt (1986). Their study provided stimulation for this research effort and yielded some interesting and informative results. Unfortunately, sample size and psychometric limitations forced them to collapse several motivation, expectation, and situational variables together. This resulted in difficulty in interpreting their motivational variable, and precluded the examination of expectations and motivation separately. In addition, their study did not include self-efficacy or ability measures, and was based on a relatively small sample. The present effort was designed to overcome such limitations.

METHOD

SUBJECTS

The data collection was conducted at Recruit Training Command (RTC) in Orlando, Florida. This is an eight-week training process designed to train new recruits in general Navy procedures. As a longer (i.e., several weeks or more) training program, it is different than most corporate training efforts; however, the U.S. and foreign militaries use longer-term training quite extensively (e.g., Gopher, 1982; Drakely, Herriot, & Jones, 1988; Hogan & Hogan, 1985). Other long term training efforts can be seen for police (e.g., Van Maanen, 1975), firefighters, psychiatric aides (Distefano, et al., 1988), stock brokers, and in executive education programs.

Subjects were 1037 trainees participating in recruit training. Their average age was 19.98 (SD = 2.66). Of the 1037 trainees, data were available from 666 at all three data collection points. Average age of the final sample (n = 666) was 19.84 (SD = 2.43). The final sample consisted of 368 men and 298 women.

PROCEDURE

Within one hour of their arrival, all trainees were asked to complete a pre-training questionnaire assessing a variety of individual variables, including expectations, attitudes, self-efficacy, and pre-training motivation. Hoiberg and Berry (1978) had recruits complete surveys within 48 hours of their arrival at bootcamp. Unfortunately, during that time, the recruits may have changed their initial expectations based on early training experiences. We chose the immediate administration of the survey to ensure that trainee responses were not based on the training experience, but were based strictly on pre-training factors.

Participation was voluntary and no names appeared on the questionnaires. Social security numbers were collected in order to match surveys with performance and cognitive ability measures. However, participants were assured of anonymity and no individual responses were revealed. The ASVAB, a measure of cognitive ability, was collected as part of the enlistment process, prior to recruit training.

During training, recruits were involved in classroom and field learning experiences, and in addition, completed academic and physical tests, received numerous inspections, and received honors and demerits indicative of their performance during training. At the conclusion of training, trainees completed a post-training questionnaire that assessed post-training

motivation, attitudes, training perceptions, self-evaluations, and training reactions. Table 2 shows the research design, and illustrates when each variable was measured.

Pre-training questionnaires were completed by 932 trainees, post-training questionnaires by 753 trainees (some of whom had not received the pre-training questionnaire), and "hard card"

Table 2
Research Design: Variables and Time of Measurement

TIME OF MEASUREMENT		
Pre-Training	**During Training**	**Post-Training**
Cognitive Ability	Academic Tests	Attitudes
Attitudes	Honors	Self-Efficacy
Self-Efficacy	Demerits	Perceptions of Training
Performance Expectations	Inspection Scores	Motivation
Training Expectations		Reactions
Pre-Training Motivation		Self-Rated Performance
		Training Fulfillment

data (i.e., archival training performance and cognitive ability measures) were available for 855 of the trainees. This resulted in the final sample of 666 subjects, from whom data had been collected at all three times.

Since the primary tests of the model require training performance and post-training data, the majority of analyses were conducted on a final sample that consisted only of those trainees who completed training. The exception to this was an analysis to examine factors that influenced attrition, which included samples of recruits that did and did not complete the training.

MEASUREMENT SCALES

Except where otherwise noted, all measures were based on seven point Likert-type scales, ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (7) with 'Neither Agree nor Disagree (4) as the midpoint. Some items were negatively worded, and reverse coded in later analyses. As part of the development process, the surveys were pilot tested with a small sample of recruits to ensure clarity of wording and instructions.

Some of the measures represented existing scales, while others were developed specifically for this investigation. All new scales were subject to factor analysis (principle axis utilizing oblique [Oblimin] rotation) to assess their factor structure based on the total sample (N = 1037). Initially, the number of factors was determined based on eight values of greater than 1.0. The resulting factor structure was examined for clarity of interpretation (i.e., items with high factor loadings on only one factor and conceptual similarity of items that loaded on the same factor).

In some instances, the initial solution demonstrated complex loadings (i.e., items demonstrating factor loadings of greater than .40 on two or more factors) or items that failed to load on any factor (i.e., no factor loading greater than .40 on any factor). In these cases, inter-item correlations were examined and additional factor analyses were conducted to establish a structure with the best fit both psychometrically and conceptually.

Finally, Cronbach alphas were computed to assess scale reliability. For uniformity, Cronbach alphas were computed for all multi-item scales based on the final sample of 666 recruits.

On the basis of these analyses, some items were dropped and some scales revised. Table 3 presents sample items for most of the scales. Table 4 reports the number of items in each scale, scale means, standard deviations, and Cronbach alphas. Scores were computed for each multi-item scale by averaging the items each respondent completed.

Below we describe each of the scales, including the rationale for revisions when appropriate.

Table 3
Sample Items from Measurement Scales

---

* "I have excellent reflexes" (physical self-efficacy)

* "I do well in activities where I have to remember lots of information" (academic self-efficacy)

* "How well do you think you will perform on room inspections at Recruit Training" (training performance expectations)

* "I expect that the training will provide intense controls over my behavior" (training expectations)

* "I hope that the material I learn will be presented to me in lecture format" (training desires)

* "Being in the Navy is important to me" (commitment)

* "I plan to re-enlist after my first tour" (intent to remain)

* "If I am successful in recruit training it will better enable me to perform my job in the Navy" (training to performance link - training motivation)

* "If I learn to perform well as a result of recruit training it will help me to get promoted faster" (performance to outcome link - training motivation)

* "Getting good duty stations and assignments are important to me" (valence - training motivation)

* "I had a chance to practice what I learned" (training perceptions)

* "I learned new skills and knowledge at Recruit Training" (relevance/value--training reactions)

* "I have been happy at RTC" (affect/happiness--training reactions)

Table 4

Scale Means, Standard Deviations, and Cronbach Alphas[a]

SCALE	# OF ITEMS	MEAN	SD	ALPHA
INDIVIDUAL VARIABLES (PRE-TRAINING)				
Ability				
Cognitive Ability (ASVAB)	-------	64.06	21.23	N/A
Attitudes				
Intent to Remain	2	4.67	1.34	.91
Commitment	11	5.89	.69	.82
Self-Efficacy				
Physical Self Efficacy (PSE)	10	4.88	.88	.85
Academic Self Efficacy (ASE)	8	5.27	.99	.87
Demographics				
Sex (1=female, 2=male)	1	1.55	.50	N/A
Age	1	19.84	2.43	N/A
Family History (# of military relatives)	1	2.06	1.70	N/A
EXPECTATION/DESIRE VARIABLES				
Training Expectations				
Overall	15	6.26	.54	.82
Controlled Learning Environment	6	6.53	.57	.80
Challenge	3	6.50	.74	.76
Interactions With Company Members	4	6.46	.68	.83
Training Method	2	4.69	1.43	.46
Training Desires[b]				
Overall	15	2.16	.62	.84
Controlled Learning Environment	6	2.38	.69	.83
Challenge	3	1.71	1.12	.84
Interactions With Company Members	4	2.70	.55	.86
Training Method	2	1.12	1.48	.53
Training Performance Expectations				
Training Performance Expectations	5	5.43	.81	.83
MOTIVATION VARIABLES				
Pre-Training Motivation				
Instrumentalities	12	6.22	.71	.89
Training Performance Expectancies	6	6.56	.68	.92
Valence	12	6.42	.60	.88
Pre-Training Motivation	12	268.12	65.25	.96
Post-Training Motivation				
Instrumentalities	12	6.07	.90	.90
Training Performance Expectancies	6	6.37	.90	.95
Valence	12	6.48	.58	.86
Post-Training Motivation[c]	12	258.97	74.41	.97

Table 4 (continued)

SCALE	# OF ITEMS	MEAN	SD	ALPHA
EXPECTATION FULFILLMENT VARIABLES				
Expectation Fulfillment[d]	15	-1.12	1.48	.70
Perceptions of Training	15	5.89	.69	.81
INDIVIDUAL VARIABLES (POST-TRAINING)				
Attitudes				
Intent to Remain	2	4.88	1.57	.89
Commitment	11	6.00	.76	.83
Physical Self-Efficacy (PSE)	10	5.41	.90	.87
Academic Self-Efficacy (ASE)	8	5.49	.94	.87
TRAINING EFFECTIVENESS VARIABLES				
Training Reactions				
Overall	12	5.98	.88	.91
Relevance/Value	7	6.28	.83	.88
Happiness	2	5.10	1.46	.84
Training Performance				
Academic Test Performance	4	325.42	27.48	.84
Honors (2=yes; 1=no)	1	1.06	.24	N/A
Demerits	1	4.15	2.23	N/A
Inspections (1=unsatisfactory; 2=satisfactory)	21	1.81	.10	.52
Demerits and Inspections (z score)	---	.04	.79	N/A
Overall Performance--Combined Score (z score)	---	.01	.57	N/A
Self-Rated Physical Test Performance	1	5.90	1.13	N/A
Self-Rated Overall Training Performance	5	5.19	.86	.69

[a]Sample sizes range from 651 to 666 due to missing responses.

[b]Scale can range from -3 to +3.

[c]Scale can range from 1 to 343.

[d]Scale can range from -18 to +18.

Individual Variables

Cognitive Ability. Cognitive ability was assessed using the ASVAB based on AFQT scoring. Higher scores are indicative of greater cognitive ability.

Attitudes. Two trainee attitudes were measured, *commitment* and *intent to remain*. They were measured prior to training, and again at the completion of training.

"Organizational commitment" was assessed using 11 items adapted from Mowday et al.'s (1982) 15 item scale. The full length scale has demonstrated high reliabilities in previous research (average alpha = .88 across 80 samples with a total N of over 24,000; see Mathieu & Zajac, 1990). The 11 items used in the present study were selected based on their relevance to the Navy training environment, and demonstrated sufficient alphas at both administrations (i.e., .82 and .83).

"Intent to remain" was a two item scale loosely based on Martin's (1979) work. Martin used two items, one referring to intentions to remain with the organization within the next year, and one referring to longer-term career plans. Since recruits do not have a true decision point within the next year, we revised our scale accordingly. Thus, the two items we used were: "I plan to re-enlist after my first tour" and "I plan to make a career out of the Navy." Alphas were .91 and .89 for the pre- and post-training administrations.

Self-efficacy Measures. These scales were based on the work of McIntire and Levine (1984). Their scales were originally designed for a college population so some rewording was necessary. "Academic Self-Efficacy" assessed trainees' beliefs in their ability to accomplish academic tasks. A factor analysis of the 10 academic self-efficacy items yielded a three factor solution. However, neither this solution, nor forced two or four factor solutions, produced interpretable results. A close examination of inter-item correlations and item content suggested that subjects were having a problem with the two negatively worded items. These two items were dropped, yielding an eight item scale with acceptable alphas at both administrations.

"Physical Self-Efficacy" measured perceived competence on physical tasks. A factor analysis of the 10 items relating to physical self-efficacy yielded a single factor solution. The scale demonstrated acceptable alphas at both administrations.

Demographics. Gender, age, and a list of family members who served in the military were collected at the start of training. "Family history" refers to the number of family members who

served in the military. A higher number indicates a stronger family history with the military. Family members who have served in the military are a potential source of information regarding recruit training and the military experience. Family history could be related to training expectations and desires.

Expectation/Desire Variables

Training Expectations. As noted, training expectations, desires, and perceptions must be tailored to fit the specific training environment. Potential items were identified in Hoiberg and Berry (1978) and Noe and Schmitt (1986), and supplemented by items we developed. Next, meetings with subject matter experts helped delineate the issues of relevance to new recruits, and the final list of 16 training expectation items (and parallel desires and perception items) were selected for inclusion in the current study.

A factor analysis was conducted on the 16 training expectation items. All but one item loaded cleanly on a four factor solution (oblique rotation). This item did not load in a forced three factor solution either, and the overall factor structure was less interpretable than the four factor solution. An examination of inter-item correlations confirmed the need to drop the item from the scale.

After dropping the item, the four factor solution was interpretable. The four factors were labeled: "expectations - controlled learning environment"; "expectations - challenge"; "expectations - interactions with others"; and "expectations - training method".

Alphas were acceptable for all subscales, except training method, which demonstrated an alpha of .46. It would have been interesting to be able to examine subsets of expectations, but unfortunately, the low alpha precluded the use of subscales. A total expectations scale was also formed (labeled "training expectations") from items 1 through 15. This scale demonstrated an acceptable alpha level and was used in subsequent analyses. A higher score on this scale indicates that, overall, the trainee has greater expectations of training.

Some additional work is needed on these scales, including the introduction of additional training method-type items. Expectation items will likely need to be generated for each unique training situation (clearly some of the items used in this investigation would be inappropriate for examining corporate management training). Nevertheless, the initial factor analyses and psychometric assessments are somewhat encouraging, and further work with this construct is warranted.

Training Desires. Training desire items parallel the training expectation items. That is, for each training expectation item ("I expect that..."), a similar question was developed that assessed desirability ("I hope that...") . Factor analyses and Cronbach alpha computations demonstrated similar patterns as the training expectation items, and were treated in the same fashion.

The desire items were recoded from a 1 to 7 scale into a -3 to +3 scale. This was done to support the computation of the training fulfillment scale, and is discussed in that section. A higher score on the training desire scale indicates that the trainee hoped for more from the training.

Training Performance Expectations. Five items were written that asked trainees "how well do you think you will perform on... [each major performance factor]." The five items addressed physical performance tests, academic tests, uniform inspections, room inspections, and overall performance. These items were based on a seven point Likert-type scale ranging from "Not at all Well" (1) to "Extremely Well" (7), with "Moderately Well" (4) as the midpoint.

Factor analysis yielded a clean one factor solution and the scale alpha was acceptable.

Training Motivation Variables

Training motivation was assessed using a Valence-Instrumentality-Expectancy approach (cf., Vroom, 1964; Lawler, 1973). Specifically, trainees' perceptions of the relationship between performance in training and future job performance were assessed using a six item scale. An example item is "If I am successful in recruit training it will better enable me to perform my job in the Navy." The average of trainees' responses to these items will be referred to as training-performance expectancies.

Trainees also provided ratings of the extent to which they perceived that higher performance in Navy jobs would lead to a set of 12 outcomes (hereafter referred to as instrumentalities). These outcomes include such things as: money, prestige, respect from family and friends, and an opportunity to serve the country. Finally, trainees' provided separate ratings of the importance of each of the 12 outcomes (hereafter referred to as valences). Although the instrumentalities and valences were responded to on a 1-7 point scale, the scale anchors were recoded to a -3 to +3 range to reflect both positive and negative values. This recoding was necessary in order to maintain the motivating direction of combining instrumentality and valence scores of different signs (cf., Mathieu, 1987).

Training motivation scores were calculated by first multiplying each outcome's instrumentality times its valence, and then multiplying the product by the trainees' training-performance expectancy score. This process yields 12 composite scores, each reflecting a perceived motivation consequence of performing well in training. Combining the 12 composites yields a total training motivation score. The combined scale exhibited high reliabilities at both times.

Expectation Fulfillment Variables

We use the term "Expectation Fulfillment" to refer to the extent to which training met trainees' expectations and desires. Different trainees may have the same expectations (e.g., training will be challenging) but one could desire it (i.e., desires challenge) and the other might not (i.e., desires easy training). Therefore, it is insufficient to rely simply on a comparison of pre-training expectations with post-training perceptions of training. In our example, the first trainee should be pleased if training was challenging, but the second would likely be displeased.

In addition, a trainee might desire something but realize that it is not likely to happen (as reflected by low expectations). In this case, the trainee would be pleasantly surprised if his/her desire was met. However, if the training did not fulfill his/her desires, we would not expect him/her to demonstrate the same level of disappointment as if he/she both desired and expected fulfillment.

For these reasons, we developed an index based on all three elements: expectations, desires, and perceptions of training. We contemplated using a simpler measure, asking trainees if training met their expectations. However, this form of retrospective query is subject to cognitive distortions. Trainees who feel good may report that training met their expectations regardless of what they desired or expected before training. Simply asking trainees for their perceptions of training, as we did (e.g., did you have a chance to practice during training?), removes some of the subjectivity. Computing an index based on pre-training desires and expectations, in comparison to subsequent perceptions of training, should yield a more objective measure of the extent to which training fulfilled expectations and desires.

Perceptions of Training. Sixteen items were written that parallel the expectation and desirability items, and assessed trainees' perceptions of the training (e.g., training emphasized efficiency, attention to detail, and chance to practice, and was mentally challenging). This was collapsed into a fifteen item

scale, and four subscales, in identical fashion as the training expectations and desires scales.

Expectation Fulfillment. Expectation fulfillment was computed as a function of expectations, desires, and perceptions:

$$Ef=\sum_{i=1}^{j}=(P_i-E_i)D_i$$

where Ef = total expectation fulfillment score; i = item; j = the number of perception-expectation item pairs; P = perceptions (ranges from 1 to 7); E = expectations (ranges from 1 to 7); and D = desires (ranges from -3 to +3), yielding an expectation fulfillment score that could range from -18 to +18.

The recoding of desires from 1 to 7 to -3 to +3 was designed to address one of the issues noted above; perceptions exceeding expectations have different meanings based on desirability. Thus, perceptions of challenge exceeding expectations is a positive experience for someone who desires challenge, a negative one for someone who does not. This is incorporated into our computational formula. Similarly, less challenge than expected is positive for someone who did not desire challenge, but negative for someone who desired challenge. If he/she did not care about that facet of training (zero on desirability scale), his/her score on that training fulfillment item would be zero regardless of his/her expectations or perceptions, by virtue of the multiplicative function in the equation.

The expectation fulfillment scale was computed by summing the computations from each expectation-desire-perception triad. A higher score is indicative of greater levels of fulfillment. The reliability estimates for the expectation fulfillment scale were found to be at an acceptable level. However, the use of expectation fulfillment subscales is impossible until further refinements of the expectation, desire, and perception scales yield more reliable subscales at that level.

Training Reactions

Twelve training reaction items were written to assess various components of trainees' reactions to training. Some items were designed to tap into relevance/perceived value, while others were more affective in nature.

A two factor analysis of the 12 items, rotated to an oblique solution, did not yield parsimonious results. This two factor solution had three items with complex loadings. These items were

dropped and another factor analysis was conducted. This yielded a clean two factor solution with 7 items loading on factor I (labeled "training reactions - relevance/value") and 2 items loading on factor II (labeled "training reactions - affect/happiness"). This solution is consistent with the earlier discussion of training reactions as a multi-dimensional construct. The two scales are correlated, but do not demonstrate multicollinearity (r = .51, $p < .0001$).

It should be noted that when all 12 items were forced into a single factor solution, they all demonstrated factor loadings greater than .40. In order to parallel previous studies that did not differentiate dimensions of training reactions, we provide some information on the full twelve item scale (labeled "training reactions - overall"), although the two factor solution provides more detail.

Training Performance

Measures of learning or training performance were limited to those currently used in the RTC environment. Although academic tests were administered, there was no true measure of learning possible, since no pre-tests were conducted. As such, all the measures are discussed under the heading of training performance, although they do not fit neatly into the categories identified in the review.

Correlations were computed among the training performance and reaction measures to see if any of the measures were measuring similar constructs, and to determine if a single training performance measure was possible. Table 5 shows the correlations. Only demerits and honors were so highly correlated as to require collapsing into a single composite score (r = -.74, $p < .0001$). Each measure is discussed below.

Demerits. Demerits are assigned to recruits for poor behavior (e.g., failure to follow procedure). A higher score indicates poorer performance. Demerit scores ranged from 0 to 18.

Honors. Recruits who perform well during training may be assigned a position of responsibility (e.g., lead recruit). These are referred to as honors and each recruit was coded as either receiving an honor or not receiving an honor.

Inspections. Various levels of senior personnel conduct inspections of uniforms, beds, and lockers throughout training. Recruits are expected to conform to standards taught during training, and each inspection (there were 21 of them) results in a rating of satisfactory or unsatisfactory. These were averaged

Table 5

Correlations Among Training Reaction and Performance Variables[a]

VARIABLE	1	2	3	4	5	6	7	8	9
1. Demerits	----								
2. Honors	-.09	----							
3. Inspections	-.74*	.07	----						
4. Academic Tests	-.28*	-.01	.24*	----					
5. Self-Rated Physical Performance	.04	.05	-.03	-.17*	----				
6. Self-Rated Overall Performance	-.14*	-.06	.10*	.32*	.12*	----			
7. Overall Reactions	.02	.01	-.02	-.15*	.30*	.20*	----		
8. Reaction - Relevance	.01	-.02	-.02	-.17*	.28*	-.22*	.93*	----	
9 Reaction - Happiness	-.02	.03	.01	-.07	.22*	.07	.75*	.51*	----

[a]Listwise deletion; $n=661$.

*$p<.01$.

to yield an overall inspection score. The alpha on this scale is somewhat low, and any results based on this measure should be interpreted with caution.

Academic Tests. Recruits attended lectures and were tested throughout training on information regarding shipboard procedures, navy protocol, damage control procedures, appropriate behaviors, and other naval procedures. Four tests were administered with independent content. Scores on the four tests were averaged which yielded an overall academic performance measure. This was not a measure of learning per se, as no base-line information was available.

Self-Rated Physical Performance. Throughout training, recruits take physical fitness tests. Unfortunately, the manner in which these data are maintained precluded their use as a measure of training performance. Instead, trainees were asked to rate their physical performance. This single item indicated how well trainees believed they performed on physical tests during training.

Self-Rated Performance. Five items assessed self-rated performance, similar to those that assessed performance expectations. Trainees were asked "how well did you perform on... [each major performance factor]." The five items addressed physical performance tests, academic tests, uniform inspections, room inspections, and overall performance. These items were based on a seven point Likert-type scale ranging from "Not at all Well" (1) to "Extremely Well" (7) with "Moderately Well" (4) as the midpoint. Factor analysis yielded a one-factor solution. The five items were averaged to yield an overall self-rating.

Composites. Two composite scores were developed. The first combined demerits and inspections. The second, referred to as "Overall Performance," combined demerits, inspections, honors, and academic performance. To create these scales, all scores were converted to z-scores (based on the total sample). Demerits were multiplied by -1 so higher scores would be better and consistent with the other measures. Scale scores are averages across the two and four measures, respectively.

Attrition. As an indicator of the Results category of training effectiveness, we included a measure of attrition. This was defined simply as whether or not the recruit completed training.

ANALYTIC STRATEGY

To test the relationships within the model, and to allow for an assessment of the relative effects of several independent variables, a series of hierarchical multiple regressions was computed. The choice of variables for each equation was based on the overall model. In a hierarchical model of this type, variables may serve as independent variables in some equations and dependent variables in others. In addition, some variables were included in equations that did not reflect links in the model. This was done to assess the possibility that non-hypothesized relationships might exist.

We used simultaneous entry within steps (a more conservative approach than stepwise entry) and hierarchical regression between steps whenever a theoretical or temporal determination of order

was possible (cf., Cohen & Cohen, 1983 for a detailed discussion of this analytic strategy).

RESULTS

Moving from left to right in the model, we first tested for predictors of expectations/desires and pre-training motivation. Next, we examined factors that might influence training reactions and training performance. Finally, we examined predictors of post-training self-efficacy, post-training motivation, and post-training attitudes. The following sections delineate the results of these analyses.

EXPECTATIONS & DESIRES

According to the model, individual non-ability characteristics were the only set of measures (included in this study) that were hypothesized to affect expectations and desires. Therefore, we regressed the performance and training expectation scales on all the individual characteristics, including cognitive ability. Table 6 presents the results for performance expectations and training expectations. The regression equations accounted for 39% and 24% of the variance, respectively.

Academic and physical self-efficacy and commitment were positively related to performance expectations. Physical self-efficacy and commitment were positively related to training expectations. Surprisingly, cognitive ability was negatively related to training expectations.

Next, we regressed training desires on the same variables. Table 7 presents the results of this analysis. The adjusted R^2 for the equation was .28. Physical self-efficacy and commitment were positively related to training desires.

PRE-TRAINING MOTIVATION

Pre-training motivation was regressed upon training desires and expectations, and all the individual variables. Table 8 presents the results of this analysis. The equation accounts for 46% of the variance. Training desires and training expectations were both positively related to pre-training motivation, as were physical self-efficacy and commitment.

TRAINING REACTIONS

Expectation fulfillment was hypothesized to predict training reactions. It was uncertain whether training motivation should be related to training reactions. To assess the relative effects

of these two variables, they were simultaneously entered into the equation as the first step in the regressions. Individual variables were hypothesized to be only indirectly related to training reactions, and thus, were entered simultaneously as the second step in equation, after the direct effects of expectation

Table 6

Regression of Pre-Training and Training Expectations on Pre-Training Ability and Non-Ability Variables

	Performance Expectations	Training Expectations
R^2(adjusted):	.392	.235
F(df):	53.30 (8, 640)	25.85 (8, 640)
p:	<.0001	<.0001

Variables	Beta	t	Beta	t
Family History	-.05	-1.51	.00	.08
Academic Self-Efficacy	.20	5.86**	.00	.05
Sex	.00	.04	-.06	-1.36
Intent to Remain	.04	1.14	-.00	-.12
Age	.02	.78	.04	1.02
Physical Self-Efficacy	.46	13.38**	.11	2.93**
Cognitive Ability	.07	1.81	-.21	-4.95**
Commitment	.17	4.78**	.36	8.72**

*p<.05.

**p<.01.

Table 7

Regression of Training Desires on Pre-Training Ability and Non-Ability Variables

Training Desires

R^2(adjusted): .284
F(df): 33.08 (8, 640)
p: < .0001

Variables	Beta	t
Family History	.02	.49
Academic Self-Efficacy	.02	.47
Sex	.00	-.07
Intent to Remain	.03	.76
Age	.04	1.17
Physical Self-Efficacy	.21	5.67**
Cognitive Ability	-.07	-1.65
Commitment	.40	10.17**

*p < .05.

**p < .01.

Table 8

Regression of Pre-Training Motivation on Training Desires, Expectations, and Individual Variables

Pre-Training Motivation

Step #:	1
R^2:	.460
F(df):	274.74 (2, 646)
p:	<.0001

Variables	Beta	t
Training Desires	.35	8.99**
Training Expectations	.39	10.13**

Step #:	2
R^2 change:	.070
F:	11.84
p:	<.0001

Variables	Beta	t
Training Desires	.22	5.61**
Training Expectations	.34	8.87**
Family History	.02	.86
Academic Self-Efficacy	.04	1.28
Age	-.04	-1.43
Intent to Remain	.00	.29
Sex	-.06	-1.73
Physical Self-Efficacy	.15	4.62**
Cognitive Ability	-.03	-.79
Commitment	.21	6.04**

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

fulfillment and motivation were removed. Table 9 shows the results for relevance/value and for affect/happiness. Both steps were significant in each equation. Over 30 percent of the relevance/value variance was accounted for by step 1, and 10 percent of the affect/happiness variance was accounted by step 1. Individual variables added 3% for relevance/value, but 5% for affect/happiness.

Expectation fulfillment and pre-training motivation were positively related to both training reaction measures. Physical self-efficacy was positively related to both, and intent to remain was positively related to affect/happiness reactions. Age was negatively related to both reaction measures.

TRAINING PERFORMANCE

Ability was hypothesized to be a strong predictor of training performance. Expectation fulfillment, pre-training motivation, and all individual variables were simultaneously entered into the regression equation for each performance measure. Table 10 presents the results for each of the four training performance measures.

Forty-eight percent of the variance was accounted for in academic performance, with the vast majority of it attributable to cognitive ability. Cognitive ability was strongly, positively related to academic performance. Older trainees and women also performed better. Academic self-efficacy was positively related, and physical self-efficacy was negatively related to academic performance. Only 4% of the variance in demerits and inspection performance was accounted for; cognitive ability was positively related, and expectation fulfillment was negatively related.

Because the physical test measures were unusable, we had to rely on self-ratings of physical performance. Twenty percent of the variance was accounted for, with physical self-efficacy accounting for the largest share. Physical self-efficacy, pre-training motivation, and expectation fulfillment were all positively related to physical performance. Older, and female trainees reported lower physical performance. Academic self-efficacy was negatively related to physical performance.

Twenty-seven percent of the variance was accounted for in self-rated overall training performance. Academic and physical self-efficacy were both strongly positively related to overall performance. Expectation fulfillment and commitment were also positively related to overall performance.

Table 9

Regression of Training Reactions on Expectation Fulfillment, Pre-Training Motivation, and Individual Variables

	Training Reactions Relevance/Value	Training Reactions Affect/Happiness
Step #:	1	1
R^2:	.311	.097
F(df):	146.39 (2, 642)	35.48
p:	< .0001	< .0001

Variables	Beta	t	Beta	t
Expectation Fulfillment	.36	10.78**	.19	4.91**
Pre-Training Motivation	.48	14.64**	.28	7.45**

Step #:	2	2
R^2 change:	.034	.050
F:	4.09	4.71
p:	< .0001	< .0001

Variables	Beta	t	Beta	t
Expectation Fulfillment	.35	10.44**	.19	5.07**
Pre-Training	.40	9.97**	.18	3.90**
Family History	-.02	-.49	-.03	-.67
Academic Self-Efficacy	-.02	-.63	-.03	-.83
Age	-.10	-3.15**	-.14	-3.74**
Intent to Remain	.00	.01	.08	1.89**
Sex	-.06	-1.58	-.05	-1.04
Physical Self-Efficacy	.10	2.66**	.14	3.38**
Cognitive Ability	-.07	-1.90	.04	.92
Commitment	.06	1.45	.09	1.83

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

Table 10

Regression of Training Performance Indices on Expectation Fulfillment, Pre-Training Motivation, and Individual Variables

	Training Performance-- Academic	Training Performance-- Demerits & Inspections
R^2(adjusted):	.484	.043
F(df):	61.28 (10, 634)	3.89 (10, 634)
p:	<.0001	<.0001

Variables	Beta	t	Beta	t
Pre-Training Motivation	.05	1.54	.01	.25
Expectation Fulfillment	-.02	-.63	-.10	-2.47*
Family History	-.02	-.69	.03	.73
Academic Self-Efficacy	.10	2.75**	.05	1.08
Age	.12	3.96**	.04	1.08
Intent to Remain	.03	.92	.03	.73
Sex	-.09	2.60**	.00	-.06
Physical Self-Efficacy	-.08	-2.29**	-.01	-.27
Cognitive Ability	.61	17.54**	.19	3.96**
Commitment	.05	1.22	-.01	-.21

Table 10 (continued)

	Self-Rated Performance Physical Tests	Self-Rated Overall Training Performance
R^2(adjusted):	.204	.267
F(df):	17.52 (10, 634)	24.51 (10, 634)
p:	<.0001	<.0001

Variables	Beta	t	Beta	t
Pre-Training Motivation	.11	2.41*	.06	1.52
Expectation Fulfillment	.08	2.10*	.11	3.12**
Family History	.00	.17	.00	.10
Academic Self-Efficacy	-.09	-2.35*	.36	9.46**
Age	-.11	-2.89**	.04	1.23
Intent to Remain	-.05	-1.39	.02	.43
Sex	.13	-3.17**	-.03	-.85
Physical Self-Efficacy	.44	10.74**	.23	5.50**
Cognitive Ability	.04	.86	.06	1.52
Commitment	.00	.18	.09	2.10*

*p<.05.

**p<.01.

POST-TRAINING VARIABLES

Expectation fulfillment was hypothesized to influence post-training self-efficacy, motivation, and attitudes. Pre-training individual characteristics were hypothesized to indirectly influence the same post-training variables.

To understand the impact of expectation fulfillment and pre-training individual characteristics on post-training self-efficacy, the variance attributable to pre-training self-efficacy should first be removed. Similarly, pre-training motivation and attitudes should first be removed from their post-measures prior to further analysis.

It is possible that changes in self-efficacy, motivation, and attitudes may be a function of training performance. That is, trainees who perform better may report that they "feel" better as well. Therefore, the variance attributable to training performance should also be removed before testing for the influence of expectation fulfillment.

To test these effects, we conducted a four-stage hierarchical regression. In stage one, the pre-training measure associated with the dependent variable was entered. In stage two, the overall training performance measure was entered. In stage three, expectation fulfillment was entered. Finally, the remaining pre-training individual characteristics were entered.

Table 11 presents the results from the hierarchical regression for physical self-efficacy. Pre-training physical self-efficacy accounted for 47% of the variance. Training performance did not account for any additional variance. This is not surprising since the training performance measure of physical performance was unusable and not included in the overall performance measure.

Expectation fulfillment was positively related to post training self-efficacy, although it accounted for very little additional variance. Finally, pre-training motivation demonstrated a small, positive relationship.

Table 12 presents the results from the analysis for post-training academic self-efficacy. Pre-training academic self-efficacy accounted for 21% of the variance in post-training academic self-efficacy. Training performance was positively related to post-training academic self-efficacy, and accounted for an additional 2% of the variance. Expectation fulfillment was non-significant when entered alone, but demonstrated a significant positive effect when entered with the remaining individual characteristics. In addition, physical self-efficacy,

Table 11

Regression of Post-Training Physical Self-Efficacy on Pre-Training Self-Efficacy, Training Performance, Expectation Fulfillment, Pre-Training Motivation, and Individual Variables

Step #: 1
R^2: .472
F: 575.95
p: < .0001

Variables	Beta	t
Pre-Training Physical Self-Efficacy	.69	24.00**

Step #: 2
R^2 change: .002
F: 2.04
p: = .1534

Variables	Beta	t
Pre-Training Physical Self-Efficacy		
Training Performance	NS	

Step #: 3
R^2 change: .008
F: 9.39
p: < .005

Variables	Beta	t
Pre-Training Physical Self-Efficacy	.70	24.25**
Training Performance	-.03	-1.11
Expectation Fulfillment	.09	3.06**

Table 11 (continued)

Step #: 4
R^2 change: .015
F: 2.34
p: < .05

Variables	Beta	t
Pre-Training Physical Self-Efficacy	.68	20.53**
Training Performance	-.01	-.43
Expectation Fulfillment	.10	3.39**
Family History	.03	1.20
Age	-.06	-1.94
Intent to Remain	.00	.08
Academic Self-Efficacy	-.06	-1.88
Sex	.00	-.17
Pre-Training Motivation	.09	2.70**
Cognitive Ability	.02	.53
Commitment	.00	.26

*p < .05.

**p < .01.

Table 12

Regression of Post-Training Academic Self-Efficacy on Pre-Training Academic Self-Efficacy, Training Performance, Expectation Fulfillment, Pre-Training Motivation,and Individual Variables

Step #: 1
R^2: .210
F: 172.53
p: < .0001

Variables	Beta	t
Pre-Training Academic Self-Efficacy	.46	13.14**

Step #: 2
R^2 change: .017
F: 14.51
p: < .001

Variables	Beta	t
Pre-Training Academic Self-Efficacy	.44	12.50**
Training Performance	.13	3.81**

Step #: 3
R^2 change: .004
F: 3.67
p: < .05

Variables	Beta	t
Pre-Training Academic Self-Efficacy		
Training Performance		
Expectation Fulfillment	NS	

Table 12 (continued)

Step #: 4
R^2 change: .039
F: 4.18
p: $<.0001$

Variables	Beta	t
Pre-Training Academic Self-Efficacy	.35	9.06**
Training Performance	.09	2.39**
Expectation Fulfillment	.10	2.78**
Family History	.00	.20
Age	.03	.75
Intent to Remain	.00	.10
Physical Self-Efficacy	.08	2.14*
Sex	-.04	-1.08
Pre-Training Motivation	.10	2.43*
Cognitive Ability	.20	4.49**
Commitment	.03	.67

*$p<.05$.

**$p<.01$.

pre-training motivation, and cognitive ability demonstrated positive relationships.

Table 13 shows the regression results for post-training motivation. Pre-training motivation accounted for 34% of the variance, and training performance explained no additional variance. Expectation fulfillment accounted for an additional 10% of the variance after removing the effect of both pre-training motivation and training performance. Physical self-efficacy demonstrated a small positive relationship as well.

Table 14 reports the results for the post-training commitment regression. Pre-training commitment accounted for 20% of the variance, and training performance accounted for no significant additional variance. Expectation fulfillment accounted for an additional 6% of the variance. Cognitive ability also showed a positive relationship with post-training commitment.

Table 15 presents the results from the regression of post-training intent to remain. Pre-training intent to remain accounted for 28% of the variance, and training performance added no significant additional variance. Expectation demonstrated a small, positive relationship with post-training intent to remain, as did physical self-efficacy and pre-training commitment. Women demonstrated lower post-training commitment after removing the variance for the previous variables in the regression.

Attrition

In addition to the regression analyses, a discriminant function analysis was computed to determine whether it was possible to predict which trainees would complete training based on their initial responses to scale items. Statistically, discriminant function analysis seeks to find the best linear combination of predictor scores that can most effectively predict group membership. In order to have groups of relatively equal size, a random sample of 150 subjects was drawn from the original sample (i.e., those who finished the training) for comparison to 175 in the sample that left training.

The discriminant function analysis revealed that four variables appeared to be significant predictors of attrition: expectations ($p < .05$), self-efficacy ($p < .01$), commitment to the Navy ($p < .01$), and pre-training motivation ($p < .02$). A Chi square coefficient of 12.07 ($df = 4, 340, p < .02$) indicated that the amount of variance predicted in attrition scores (16%) was statistically significant.

Table 13

Regression of Post-Training Motivation on Pre-Training Motivation, Training Performance, Expectation Fulfillment, and Individual Variables

Step #: 1
R^2: .337
F: 327.74 (1, 643)
p: <.0001

Variables	Beta	t
Pre-Training Motivation	.58	18.10**

Step #: 2
R^2 change: .001
F: 1.14
p: =.2853

Variables	Beta	t
Pre-Training Motivation		
Training Performance	NS	

Step #: 3
R^2 change: .095
F: 107.91
p: <.0001

Variables	Beta	t
Pre-Training Motivation	.62	20.65**
Training Performance	.00	.03
Expectation Fulfillment	.31	10.39**

Table 13 (continued)

Step #: 4
R^2 change: .017
F: 2.51
p: $<.01$

Variables	Beta	t
Pre-Training Motivation	.57	15.46**
Training Performance	.04	1.08
Expectation Fulfillment	.32	10.32**
Family History	.01	.46
Age	-.04	-1.21
Intent to Remain	.02	.72
Academic Self-Efficacy	-.04	-1.21
Sex	-.06	-1.78
Physical Self-Efficacy	.11	3.32**
Cognitive Ability	-.03	-.91
Commitment	.02	.45

*$p<.05$.

**$p<.01$.

Table 14

Regression of Post-Training Commitment on Pre-Training Commitment, Training Performance, Expectation Fulfillment, Pre-Training Motivation, and Individual Variables

Step #: 1
R^2: .200
F: 161.59 (1, 643)
p: < .0001

Variables	Beta	t
Pre-Training Commitment	.45	12.71**

Step #: 2
R^2 change: .000
F: .05
p: = .83

Variables	Beta	t
Pre-Training Commitment		
Training Performance	NS	

Step #: 3
R^2 change: .064
F: 55.64
p: < .0001

Variables	Beta	t
Pre-Training Commitment	.49	14.21**
Training Performance	.02	.55
Expectation Fulfillment	.26	7.46**

Table 14 (continued)

Step #: 4
R^2 change: .031
F: 3.50
p: < .001

Variables	Beta	t
Pre-Training Commitment	.37	8.51**
Training Performance	.05	1.28
Expectation Fulfillment	.27	7.67**
Family History	-.05	-1.42
Age	-.01	-.40
Sex	-.05	-1.33
Academic Self-Efficacy	-.03	-.74
Physical Self-Efficacy	.03	.80
Intent to Remain	.05	1.43
Pre-Training Motivation	.18	4.29**
Cognitive Ability	.10	.17

*p < .05.

**p < .01.

Table 15

Regression of Post-Training Intent to Remain on Pre-Training Intent to Remain, Training Performance, Expectation Fulfillment, Pre-Training Motivation, and Individual Variables

Step #: 1
R^2: .282
F: 254.10 (1, 643)
p: <.0001

Variables	Beta	t
Pre-Training Intent to Remain	.53	15.94**

Step #: 2
R^2 change: .001
F: .57
p: =.4506

Variables	Beta	t
Pre-Training Intent to Remain		
Training Performance	NS	

Step #: 3
R^2 change: .014
F: 13.15
p: <.001

Variables	Beta	t
Pre-Training Intent to Remain	.54	16.25**
Training Performance	-.01	-.41
Expectation Fulfillment	.12	3.63**

Table 15 (continued)

Step #: 4
R^2 change: .056
F: 6.81
p: < .0001

Variables	Beta	t
Pre-Training Intent to Remain	.45	12.80**
Training Performance	.04	1.06
Expectation Fulfillment	.14	4.30**
Family History	.03	.80
Age	-.03	-.98
Physical Self-Efficacy	.11	2.83**
Academic Self-Efficacy	-.03	-.85
Sex	-.12	-3.11**
Pre-Training Motivation	.00	-.14
Cognitive Ability	-.03	-.63
Commitment	.18	4.39**

*p < .05.

**p < .01.

DISCUSSION

This investigation was designed as an initial empirical test of some of the key constructs and relationships in the model of training effectiveness developed here. It was meant to assess the usefulness of the measures and the model for understanding training effectiveness. In particular, the data collection focused on trainee attitudes, expectations, and motivational variables, and attempted to determine if they demonstrate sufficient utility to warrant further examination.

In general, the investigation revealed that most of the measures developed and used in this effort have acceptable psychometric qualities, and can be used in future research. Additional work is needed on some variables.

The central variables of trainee attitudes, expectations, and motivation investigated here were found to be related to other variables in the model, and appeared useful in improving our understanding of the training effectiveness process. In addition, although the power of the tests may have yielded some "trivial" significant results, the amount of variance accounted for in most of the regressions was quite respectable, even in the survey-to-archives analyses. The encouraging findings of this investigation suggest that additional research is warranted to further understand the role of these variables with regard to training effectiveness. Below we discuss key findings in more detail.

EXPECTATIONS, DESIRES, & MOTIVATION

Physical self-efficacy and commitment were consistently related to expectations and desires. Trainees who possessed higher levels of physical self-efficacy, and who were more committed, had greater performance expectations, and expected and desired more from the training. This is logical; it implies that trainees who believe that they can perform well, and those that are more committed to the organization, want more from the training. Interestingly, trainees with higher cognitive ability had lower training expectations. They did not show any differences with regard to desires. Thus, "smarter" trainees hoped for the same things in training but had lower expectations than other trainees.

Physical self-efficacy, commitment, desires, and expectations were all positively related to pre-training motivation, with expectations demonstrating the largest effect. Again, this makes sense since those trainees who believe they can do well (physical self-efficacy), are committed to the

organization, or have greater desires or expectations, are also more motivated to perform well in training.

TRAINING REACTIONS

Expectation fulfillment and pre-training motivation were both strongly, positively related to training reactions. Several individual variables also demonstrated small effects.

It is encouraging that expectation fulfillment was so strongly related to training reactions. When the training meets or exceeds trainees' expectations and desires, they view the training as more relevant, and feel more positive about the training. This is support for using the "met expectation" approach to studying training expectations, as suggested by research in the turnover literature.

TRAINING PERFORMANCE

As predicted, cognitive ability was a strong predictor of academic performance and of self-rated overall training performance. Pre-training motivation was positively related to both self-rated measures of performance.

The self-efficacy measures demonstrated good discriminability. The academic self-efficacy measure was positively related, and physical self-efficacy was negatively related to academic performance, and vice-versa for physical performance. Both measures were positively related to self-rated, overall training performance.

Older trainees and females demonstrated better academic performance than younger trainees and males. Surprisingly, pre-training motivation was negatively related to academic performance. As academic performance was not a true measure of learning, we would have expected little or no effect for motivation.

POST-TRAINING SELF-EFFICACY, ATTITUDES, AND MOTIVATION

By first removing the pre-training variance, we applied a conservative approach to examining the influences on the post-training measures. Regardless, we found some interesting predictors of the post-training measures. For example, even after removing the pre-training variance, expectation fulfillment was positively related to all five post-training measures. While the magnitude of the effect for post-training self-efficacy was trivial, its effect on motivation and commitment was quite significant, accounting for an additional ten and six percent,

respectively (after removing the variance from pre-training and training performance measures).

Other small effects were seen for pre-training motivation, cognitive ability, physical self-efficacy, and gender. Training performance was significant in only one equation (academic self-efficacy) and the effect was fairly small. Apparently, performing well in training is not the key factor in determining post-training attitudes and motivation--expectation fulfillment is. These results are important because they suggest that motivation after training (which is likely to affect the extent to which the trainee will transfer newly acquired skills) is affected by the trainees' expectations, and the extent to which training met those expectations.

ATTRITION

While the results from this investigation regarding attrition cannot be considered definitive, it is reasonable to conclude that individual and organizational factors can have an impact on whether a trainee completes training. In the present case, expectations, self-efficacy, commitment, and motivation were all significant factors. These results clearly require replication and extension. If supported, they suggest that pre-training assessment of certain factors may help identify trainees who are at risk of not completing training. Options at that point may include remedial programs, or depending on the situation, denial of entry into training.

SUMMARY OF DATA COLLECTION INTERPRETATION

This investigation had certain strengths. It was conducted in a field setting, and incorporated longitudinal data collection from multiple surveys and archival data sources. Reliability estimates were available for almost all measures. The large sample size provided ample power to test all the hypotheses. However, the effort was not without its limitations.

To begin with, several key constructs in the model were not testable in this environment. The training environment was relatively constant, with training method and content similar for all participants. In addition, the trainees represented new members of the organization, and transfer of training was not assessed. Thus, no training or organizational/situational variables could be included in this investigation.

The biggest weakness in the investigation was the poor learning and training performance measures. We were limited to employing training performance measures currently used at RTC. While these may be useful for administrative purposes, they were

not ideal for the needs of the current research. Since no pre-learning measures were collected, there could be no assessment of pre-post learning improvement. In addition, some of the performance measures (i.e., honor, demerits) were used for motivational purposes as much as for evaluation, and the physical performance measures were unusable. Despite the potential problems with the training performance measures, this investigation still revealed some interesting findings. However, any follow-up research should consider the quality and availability of learning and performance measures that are available.

On the basis of this effort, we can strongly encourage additional research in this area. There is some additional work to be done in scale development, particularly in the areas of motivation and expectations. Furthermore, future research should examine measures of trainee attitudes, motivation, training expectations, and self-efficacy. The use of a training fulfillment measure (as developed in this investigation) holds particular promise for improving our understanding of the training effectiveness process. Although this investigation merely scratched the surface, we found some evidence for processes related to training effectiveness. Further research is warranted.

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CONCLUSIONS

This project met all of the goals noted at the beginning of the report. We developed a conceptual model of training effectiveness that helped to integrate research results from diverse literatures. On the basis of that, we conducted an empirical field investigation to assess the usefulness of the model. In the empirical investigation, we identified and developed some useful measures, and lent some support to the proposed model. However, as noted earlier, it is impossible to test all variables, relationships, and hypotheses in one study. Some measurement issues and research needs, as revealed by the literature review and the empirical study, are noted below.

MEASUREMENT ISSUES

1) Most of the previous research has examined training reactions as a unidimensional construct. We believe that it is multi-dimensional and found some preliminary support for that belief. Additional work is needed to develop sound scales for assessing training reactions. Item development, factor analysis, and validation work are all necessary.

2) Training expectations have shown some promise in clarifying the training effectiveness process. However, the factor analytic work in our study suggested that there are different sub-groups of training expectations (e.g., pertaining to training method, pertaining to challenge). One of the subscales demonstrated poor reliability. Future work is needed to improve this measure to allow for an examination of subscales. In particular, does expectation fulfillment for one subscale have greater impact than for others? Scale development work is needed first.

3) We believe that self-efficacy is a key concept for understanding training effectiveness. The academic self-efficacy scale did not hold together. Further work is needed on that measure. In addition, the specificity of the self-efficacy measures should be examined as well.

4) We treated training motivation as an overall concept, measurable over time. Future research should attempt to develop sub-scales of training motivation specifically targeting motivation to attend, motivation to learn, and motivation to transfer. These measures might demonstrate better predictability at appropriate points in the model.

RESEARCH QUESTIONS/NEEDS

1) What determines the transferability of self-efficacy across tasks? What are the antecedents and consequences of

self-efficacy as it relates to training? How does improved self-efficacy relate to transfer? We would hypothesize, that in transfer environments with poor situational favorability (e.g., poor supervisor support), high self-efficacy is a more critical predictor of transfer. This is based on Bandura's (1986) clinical work with self-efficacy.

2) What are the antecedents of training expectations and desires? To what extent are they formed through organizational experiences? Which organizational experiences are most salient? How do supervisors and co-workers affect training expectations?

3) Does the purpose of training (e.g., reward versus punishment; to improve in current job versus prepare for promotion) affect training motivation and desires?

4) There has been a little research on the organizational and situational factors that facilitate or inhibit transfer. Further work is needed. Perhaps this research should begin with rich, qualitative data collection based on diary keeping and content analysis, supplemented by interviews. What exactly do peers and superiors do that is related to change on the part of trainees?

5) What is the impact of conditional knowledge on transfer of training? Most of the studies that examined conditional knowledge did so in an academic or clinical environment. Do similar results occur in organizational settings? Does it work because of its effect on motivation to transfer?

6) What is the relationship among the six categories of training outcomes in our proposed typology? Under what circumstances is the typology hierarchical?

7) What are the relative effects of ability and motivation on training effectiveness? This should be tested in research using pre- and post-measures of training performance and learning. We would hypothesize that ability is related to both pre- and post-measures, but that motivation is related to changes from pre to post. In addition, are there interaction effects, and if so, are these contingent upon characteristics of the training task?

8) Further work is needed that examines aptitude training interactions. When do they occur?

9) Do different forms of training needs analysis yield better results/organizational effectiveness?

10) How does the training effectiveness model apply to team training? Cohesiveness is a key to team performance (Salas, Dickinson, Tannenbaum, & Converse, 1992). Do trainee attitudes

play a more important part in this context? Are trainees' expectations and motivations shaped by teammates reactions during training? If teammates express boredom, lack of interest, or argue, does this undermine training effectiveness? Do teammates provide feedback that can motivate other teammates to learn and transfer? How can this be encouraged? Some team training is designed to enhance "teamness." How do we measure this construct before, and after training, to determine attitude change? In measuring reactions to team training, we must consider variability as well as averages. What do outliers tell us about the team training process?

RECOMMENDATIONS

IMPLICATIONS FOR TRAINING

One of the objectives of the present research was to provide a basis for generating principles of training system design that will maximize the chances that training will be successful. In particular, we sought to begin providing guidance for training system designers through an understanding of those factors that affect training effectiveness. From the current findings, the following initial principles can be offered in this regard:

1) The level of self-efficacy of trainees should be assessed prior to training.

2) Remedial training to raise self-efficacy levels prior to training will enhance probability of positive training outcomes.

3) Trainees should be led to have realistic expectations for training. Interventions to meet this objective should be designed.

4) Interventions designed to increase trainee commitment to the organization will enhance the likelihood of successful training.

5) Efforts to improve trainee motivation prior to training can lead to better training outcomes.

Overall, these results imply that no matter how well designed a training system is, training effectiveness will not be optimized without a consideration of pertinent individual and organizational factors.

SUMMARY

In summary, a process view of training effectiveness should yield dividends in terms of improved understanding of crucial training variables, and improved training outcomes. The development of diagnostic measures based on the key components in the model can serve as training evaluation tools to specifically target where interventions in the training process are needed. Hopefully, the framework we have developed can guide future research and continue to increase our understanding of why training is effective.

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COORDINATION

This effort has been coordinated with a number of agencies and organizations. In particular, the work was briefed in detail at Training Technology Technical Group (T2TG) meetings to representatives from the Naval Personnel Research and Development Center (NPRDC), the Air Force's Armstrong Lab, and the Army Research Institute (ARI).

In addition, a paper presentation representing this effort was presented at the 14th annual Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) in San Antonio, Texas, in November, 1992. The work has also been coordinated with researchers at several universities, including the State University of New York, Pennsylvania State University, and Michigan State University.

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