Toward an Integrative Theory of Training Motivation: A Meta-Analytic Path Analysis of 20 Years of Research

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This article meta-analytically summarizes the literature on training motivation, its antecedents, and its relationships with training outcomes such as declarative knowledge, skill acquisition, and transfer. Significant predictors of training motivation and outcomes included individual characteristics (e.g., locus of control, conscientiousness, anxiety, age, cognitive ability, self-efficacy, valence, job involvement) and situational characteristics (e.g., climate). Moreover, training motivation explained incremental variance in training outcomes beyond the effects of cognitive ability. Meta-analytic path analyses further showed that the effects of personality, climate, and age on training outcomes were only partially mediated by self-efficacy, valence, and job involvement. These findings are discussed in terms of their practical significance and their implications for an integrative theory of training motivation.

Traditionally, training researchers have focused on the methods and settings that maximize the reaction, learning, and behavior change of trainees (Tannenbaum & Yukl, 1992). This research has sought to understand the impact of training media, instructional settings, sequencing of content, and other factors on training effectiveness. However, several reviews of training research have emphasized that because the influence of these variables on individuals' learning and behavior varies, research must examine how personal characteristics relate to training effectiveness (Campbell, 1988; Tannenbaum & Yukl, 1992). For example, Pintrich, Cross, Kozma, and McKeachie (1986) wrote that

> whereas early instructional psychology dealt primarily with instructional designs involving matters of manipulating presentation and pacing of instructional material, it has become clear that learners seek to learn; they transform what they receive from instruction and create and construct knowledge in their own minds. Thus, what the learner brings to the instructional situation in prior knowledge and cognitive skills is of crucial importance. Although there is a variety of learner characteristics that influence learning and instruction (cf Corno & Snow, 1986), two of the most important are intelligence and motivation. (p. 613)

Research linking intelligence or (more precisely) general cognitive ability to training and learning has provided strong and robust findings (e.g., Ree & Earles, 1991). However, researchers have only recently turned their attention to training motivation

(Tannenbaum & Yukl, 1992). Following Kanfer (1991), we define *training motivation* here as the direction, intensity, and persistence of learning-directed behavior in training contexts. Empirical work on training motivation has been characterized by two approaches. In the first approach, a comprehensive model of how individual and situational characteristics influence training motivation and learning is proposed and tested (e.g., Facteau, Dobbins, Russell, Ladd, & Kudisch, 1995; Mathieu, Tannenbaum, & Salas, 1992; Noe & Schmitt, 1986). The other approach has involved specifying predictors of training motivation and examining their relationships with learning (e.g., Baldwin, Magjuka, & Loher, 1991; Martocchio & Webster, 1992). These models and predictors have varied greatly over the past two decades. The result has been a more extensive nomological network for training motivation, but at the cost of convergence and clarity regarding which specific factors can be leveraged to improve it.

The purpose of this article is to review and integrate this burgeoning literature by taking a first step toward an integrative theory of training motivation. To accomplish this, we followed a four-stage process. First, we conducted a narrative review of existing research on training motivation, focusing only on those specific variables that have been linked to training effectiveness using motivation or learning theories and have been examined in a number of studies in the training literature. Second, we followed existing models of training motivation (Baldwin & Magjuka, 1997; Facteau et al., 1995; Martocchio, 1992; Mathieu & Martineau, 1997; Mathieu et al., 1992; Noe, 1986; Quinones, 1995) to arrange those variables into two competing theoretical structures, one in which the effects of distal variables are completely mediated by more proximal ones, and one in which only partial mediation occurs. Third, we used meta-analysis to derive the corrected correlation values for each relationship in the competing structures. Fourth, meta-analytic path analysis was used to test which theoretical structure was most consistent with the empirical findings generated in the literature. This process therefore combined a traditional narrative review, theory-building, meta-analysis, and

the emerging technique of meta-analytic path analysis (Viswesvaran & Ones, 1995).

A Narrative Review of Research on Training Motivation

The training literature has generally recognized that training motivation can be influenced by both individual and situational characteristics (e.g., Mathieu & Martineau, 1997; Noe, 1986; Tannenbaum & Yukl, 1992). If one examines the specific individual and situational characteristics examined by training scholars over the past two decades, one finds a degree of convergence about which specific characteristics seem to be important theoretically. For the sake of clarity, we italicize these variables in the following section. As noted above, our review examines only those characteristics that (a) have been linked to training motivation and outcomes using motivation or learning theories and (b) have been examined across several studies in a training or learning context. The second condition reflects the fact that only variables that have been examined across several studies can be included in a quantitative review of this type. Thus, although we mention other, less commonly examined variables in the narrative review below, we cannot include them in the quantitative sections of the article.

On the basis of these criteria, we principally review the following individual and situational characteristics: personality variables, job and career variables, self-efficacy, valence, demographics, cognitive ability, climate, and support. In the following section, we discuss the relevance of these variables to a theory of training motivation. In addition, we discuss the role that training motivation plays in training outcomes such as learning and transfer. Because training outcomes were the subject of a recent meta-analytic review (Alliger, Tannenbaum, Bennett, Traver, & Shotland, 1997), we provide only a brief discussion of the relationships among outcomes.

Individual Characteristics and Training Motivation

Personality refers to the relatively stable characteristics of individuals (other than ability) that influence their cognition and behavior. Personality is found in many motivation theories, because it creates differences in self-set goals and the cognitive construction of individuals' environments, both of which go on to create between-person differences in behavior (Kanfer, 1991). Research linking personality to training motivation has examined narrow traits as well as wider traits included in the Big Five personality taxonomy (Digman, 1990). In terms of the former, Mathieu, Martineau, and Tannenbaum (1993) showed that trainees high in *achievement motivation* were more motivated to learn. Webster and Martocchio (1993) linked *anxiety* to reduced training motivation. Noe (1986) proposed that individuals with an internal *locus of control* have more positive attitudes toward training opportunities because they are more likely to feel that training will result in tangible benefits. This relationship was confirmed in Noe and Schmitt (1986). Although these three narrow traits have been examined with some frequency, other traits have been explored in only one or two studies. These include cognitive playfulness (Martocchio & Webster, 1992), positive and negative affectivity (Bretz & Thompsett, 1992), need for dominance (Kabanoff & Bottger, 1991), and competitiveness (Mumford, Baughman, Uhlman, Costanza, & Threlfall, 1993).

Mount and Barrick (1998) noted that despite the impact of their meta-analysis of the Big Five, "there remains a relative void in the literature regarding the relationship between personality dimensions and training outcomes" (p. 852). However, recent research has in fact linked the Conscientiousness factor of the Big Five to training motivation. Martocchio and Judge (1997) showed that conscientious individuals had more confidence in their ability to learn the training materials. Similarly, Colquitt and Simmering (1998) showed that conscientious learners had higher self-efficacy and a stronger desire to learn the training content. Other Big Five variables, such as extraversion, have appeared in only one or two studies (Ferris, Youngblood, & Yates, 1985).

Aside from personality, past research has shown that training motivation is a function of variables related to one's job and career. Such variables include job involvement, organizational and career commitment, and career planning and exploration. *Job involvement* is defined as the degree to which an individual identifies psychologically with work and the importance of work to a person's total self-image (Brown, 1996; Lodahl & Kejner, 1965). Researchers have suggested that people who are highly involved with their jobs are more likely to be motivated, because participation in training can increase skill levels, improve job performance, and increase feelings of self-worth (Martineau, 1995; Mathieu et al., 1993).

Organizational commitment refers to an individual's involvement in and identification with an organization. Organizational commitment includes acceptance and belief in the organization's goals and values, a willingness to exert effort for the organization, and a desire to maintain membership in the organization (Mowday, Porter, & Steers, 1982). Meyer, Allen, and Smith (1993) noted that the same type of commitment can be referenced to a person's occupation, termed here *career commitment* (e.g., Blau, 1988). The higher individuals' levels of organizational or career commitment, the more likely they are to view training as useful for themselves and the organization. Researchers have shown that commitment is positively related to motivation to learn and reactions to training (e.g., Facteau et al., 1995; Mathieu, 1988; Quinones, Ford, Sego, & Smith, 1995; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991).

Career exploration refers to self-assessment of skill strengths and weaknesses, career values, interests, goals, or plans, as well as the search for job-related information from counselors, friends, and family members (Mihal, Sorce, & Compte, 1984; Stumpf, Colarelli, & Hartman, 1983). Because it helps individuals identify their strengths, weaknesses, and interests, persons who have high levels of career exploration are likely to have high training motivation, because they can more clearly see the link between learning and the development of their strengths and weaknesses (e.g., Facteau et al., 1995; Noe & Wilk, 1993). *Career planning* refers to the extent to which employees create and update clear, specific, plans for achieving career goals. Career planning might relate to training motivation, because individuals who engage in planning see more potential benefits to training (Mathieu et al., 1993), a relationship that was supported by Facteau et al. (1995) and Martineau (1995). Other career variables have been examined with less frequency, including career identity and resilience (e.g., Carson & Bedeian, 1994).

Self-efficacy refers to an individual's "beliefs in one's capabilities to organize and execute the courses of action required to

produce given attainments" (Bandura, 1997, p. 3). Self-efficacy has been shown to be positively and strongly related to job performance (e.g., Stajkovic & Luthans, 1998). Self-efficacy also relates to task choice, task effort, and persistence in task achievement (Gist & Mitchell, 1992). In a training environment, such results are likely to translate into a positive relationship between self-efficacy and training outcomes. Indeed, research has consistently shown positive relationships between self-efficacy, motivation to learn, and learning (e.g., Gist, Stevens, & Bavetta, 1991; Martocchio & Webster, 1992; Mathieu et al., 1992; Quinones, 1995).

On the basis of expectancy theory (Vroom, 1964), researchers have suggested that *valence*, or individuals' beliefs regarding the desirability of outcomes obtained from training, is related to training success. For example, Mathieu et al. (1992) found that motivation was a function of perceptions that increased job performance (facilitated by training) led to feelings of accomplishment, higher pay, and greater potential for promotion. Colquitt and Simmering (1998) found that trainees who valued outcomes linked to learning showed increased motivation levels.

Demographics refer to the ascribed or achieved characteristics of individuals. Although scholars have occasionally considered these variables in studies of training, they have most often been employed only as statistical control variables. Only rarely have demographics been the focus of empirical research, and there is little theory linking demographics to training outcomes. The two demographic variables that appear most frequently in studies of training are gender and age. In terms of gender effects on learning, results appear equivocal. Whereas Feinberg and Halperin (1978) showed that women have lower learning levels, Webster and Martocchio (1995) failed to detect significant gender effects. The failure to find consistent effects for gender is not surprising, given the lack of theoretical rationale for such effects.

In regard to *age,* however, empirical results seem more consistent. For example, many studies have provided evidence of a negative relationship between age and learning (Gist, Rosen, & Schwoerer, 1988; Martocchio, 1994; Martocchio & Webster, 1992). Indeed, this relationship is supported by research investigating effects of aging on learning, memory, and problem solving (Poon, 1985, 1987). For example, some studies have suggested that although aging increases knowledge of information, job-relevant skills, and expertise (i.e., crystallized intelligence), it decreases the ability to engage in the type of reasoning necessary for learning (fluid intelligence; Horn & Noll, 1994; Willis, 1987). As Sterns and Doverspike (1989) suggested, however, the negative relationship between age and learning may be due to both self-perceptions and managers' perceptions. Specifically, as employees age, managers may perceive that the employees' ability and training motivation decrease. Also, employees' fear of failure may increase as they age, preventing older employees from seeking training opportunities. It has also been reported that age is negatively related to participation in training and development programs. For example, Cleveland and Shore (1992) found that age was negatively related to both self-reported and managers' evaluations of participation in on-the-job training. McEnrue (1989) found that younger employees were more willing to engage in self-development than older employees were.

Perhaps the most commonly examined individual characteristic in the training literature is *cognitive ability.* Although there is

debate about the underlying causes (i.e., genetic vs. environmental), it is clear that individuals differ in terms of basic information processing capacities or their levels of cognitive resources (Ackerman, 1999; Kanfer & Ackerman, 1989; Norman & Bobrow, 1975). There are also differing views regarding the structure of these capacities and how they translate into knowledge or learning (Ackerman, 1987, 1999; Anderson, 1982, 1987; Baddeley, 1986; Kyllonen & Christal, 1990). Traditionally, scholars have posited that cognitive work takes place in a physical space called working memory, but more recent treatments suggest that working memory consists of that portion of long-term memory that is currently activated (Lord & Maher, 1991). Generally speaking, both conceptualizations assume that once the limits of working memory are reached, processing of additional information becomes problematic, because some pieces of information are lost. Regardless of the theoretical perspective, however, it is clear that individual differences in information processing capacity relate to individual differences in learning or, more precisely, the speed of learning (Jensen, 1998). The literature on skill acquisition, for example, is very consistent in showing that information processing capacity is very important during early stages of task performance, when a great deal of information from the environment and recalled knowledge must be represented in working memory (Ackerman, 1986, 1987; Anderson, 1982, 1987).

Regardless of how cognitive psychologists describe the process of information processing, individual differences in cognitive capacity can be captured by the single factor underlying scores on tests that measure a broad array of cognitive abilities (Hunter, 1986; Jensen, 1986; Kass, Mitchell, Grafton, & Wing, 1983; Ree & Earles, 1991; Welsh, Watson, & Ree, 1990). This single factor has been called general cognitive ability, or simply g, and has occasionally been defined as the ability to learn (Hunter, 1986). Accordingly, because acquisition of knowledge and skill depends on learning and because learning depends on individual differences in g, g should predict success in training. Indeed, g has been found to be the primary determinant of training success across a wide variety of jobs, and some have suggested that there is "not much more than g" when it comes to factors that influence training effectiveness (Ree & Earles, 1991). Because of the central role played by cognitive ability in learning, it is important in studies of training to determine whether individual and situational characteristics explain any incremental variance in training outcomes.

Situational Characteristics and Training Motivation

Although the previous discussion has centered on individual characteristics, research also suggests that situational characteristics play a key role in influencing individual behavior. Forehand and Gilmer (1964), for example, provided an early discussion about how characteristics of the organization (i.e., size, structure, systems complexity, leadership pattern, and goal directions) influence individuals' attitudes and performance. They suggested that organizational-level characteristics define the stimuli that individuals regularly confront, place constraints on behavior, and reward or punish behavior. James and Jones (1974) discussed how organizational characteristics influence individuals' perceptions of the organizational context and also how this psychological climate influences individuals' subsequent affect and behavior. Rousseau (1978) and others have suggested, however, that influential situa-

tional factors can also reside at the level of the department, job (e.g., Brass, 1981), leader (e.g., Podsakoff, MacKenzie, Moorman, & Fetter, 1990), or work group (Janz, Colquitt, & Noe, 1997; Kidwell, Mossholder, & Bennett, 1997; LePine & Van Dyne, 1998).

In the context of training studies, situational characteristics occurring at many of these levels have been examined. For example, Tracey, Tannenbaum, and Kavanagh (1995) recently examined an organization's *climate* for transfer, which refers to trainees' perceptions about characteristics of the work environment that influence the use of training content on the job. The main features of a positive climate may include adequate resources, cues that serve to remind trainees of what they have learned, opportunities to use skills, frequent feedback, and favorable consequences for using training content (Ford, Quinones, Sego, & Sorra, 1992; Quinones et al., 1995; Rouiller & Goldstein, 1993; Tracey et al., 1995). Tracey et al. (1995) found that such a climate predicted the extent to which employees engaged in trained behaviors on the job. Similarly, Rouiller and Goldstein (1993) found that a positive climate was associated with transfer of managerial skills in the fast-food industry.

Other researchers have examined the perceived presence of *manager support* or *peer support* for participation in learning activities (e.g., Birdi, Allan, & Warr, 1997; Clark, Dobbins, & Ladd, 1993; Facteau et al., 1995). Facteau et al. (1995) argued that both managers and peers can help trainees, particularly in transferring learned skills on the job (see also Baldwin & Ford, 1988). Their study of 967 managers in departments within state government agencies showed a positive link between peer support and transfer and a positive link between manager support and motivation to learn. Birdi et al. (1997) linked manager support (though not peer support) to increased on- and off-job learning, increased development, and increased career planning. Finally, Clark et al. (1993) provided results that suggest that supportive managers can emphasize the utility of training to the job, thus impacting trainee motivation.

Training Outcomes

The individual and situational characteristics reviewed above have often been linked to *motivation to learn,* defined here as the desire on the part of trainees to learn the training material (Hicks & Klimoski, 1987; Ryman & Biersner, 1975). Although many of the characteristics reviewed above have been linked directly to learning (e.g., Gist et al., 1988; Quinones et al., 1995; Tracey et al., 1995; Wilhite, 1990), others have been linked to learning through the intervening mechanism of motivation to learn (e.g., Baldwin et al., 1991; Colquitt & Simmering, 1998; Martocchio & Webster, 1992; Mathieu et al., 1992; Tannenbaum et al., 1991). This latter approach has often proved successful, because there is a robust positive relationship between motivation to learn and learning outcomes (e.g., Baldwin et al., 1991; Martocchio & Webster, 1992; Mathieu et al., 1992; Noe & Schmitt, 1986; Quinones, 1995; Tannenbaum et al., 1991).

Regardless of whether individual and situational characteristics have been linked with learning directly or through motivation to learn, many studies have operationalized learning in terms of Kirkpatrick's (1976) model of training effectiveness. This model posits that reactions to training, learning, behavior change, and

results are linked in a positive, causal manner. It is important to note that Alliger and colleagues have questioned this assumption, particularly in terms of the linkage between reactions, learning, and behavior change (Alliger & Janak, 1989; Alliger et al., 1997). An alternative to Kirkpatrick's (1976) approach has been suggested by Kraiger, Ford, and Salas (1993). Whereas learning was traditionally conceptualized as knowledge acquisition, these authors contended that learning can take the form of cognitive outcomes, skill-based outcomes, or affective outcomes (which include both motivational and attitudinal outcomes). The two most commonly examined outcomes in training research are *declarative knowledge* (a cognitive outcome) and *skill acquisition* (a skill-based outcome). *Posttraining self-efficacy* is the only motivational outcome that has been researched with any frequency. Moreover, researchers continue to measure *reactions* to training instead of other attitudinal outcomes, which could include acceptance of norms (Feldman, 1984) or tolerance for diversity (Geber, 1990). We note that although our review uses Kraiger et al.'s (1993) conceptualization of learning, we do examine the behavior change and results components of Kirkpatrick's (1976) model in the form of *transfer of training* and *job performance.*

Toward an Integrative Theory of Training Motivation

According to Kerlinger (1986), a theory is "a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena" (p. 9). Whetten (1989) suggested that one of the first steps in building a theory is asking what constructs should be included. The researcher must balance the need to be comprehensive (by including all relevant constructs) with the desire to be parsimonious (by omitting constructs that add little incremental value; Bacharach, 1989; Whetten, 1989). In the current study, we use the aforementioned narrative review to delineate the constructs that should be included in an integrative theory of training motivation, and those constructs are italicized in the previous section. It is important to recall that these constructs are included because they have been linked to training effectiveness using motivation or learning theories and have been examined in a number of studies in the training literature. However, Whetten (1989) further noted that theories go beyond what constructs are relevant to a phenomenon by specifying how and why those constructs are related. Thus, to build a theory of training motivation, we arrange the constructs identified in our narrative review into a theoretical structure based on existing motivational theories.

There are several groups of motivational theories that are relevant for building a theory of training motivation. One group is need–motive–value theories, which specify that personality, values, and motives drive between-person differences in motivation (Kanfer, 1991). These theories suggest that individuals' personality, values, and so forth create differences in self-set goals, along with differences in the cognitive construction of individuals' environments. Thus, for example, conscientiousness relates to training motivation because of the differing goals and outlooks of conscientious versus unconscientious trainees. Similarly, job involvement is related to training motivation because job-involved trainees have personal goals that are very much tied to work success. Although the need–motive–value theories support the

examination of many of the individual characteristics discussed in our narrative review, Kanfer (1991) noted that mediating processes and constructs are needed to improve explanatory power.

Cognitive choice theories, as exemplified by Expectancy × Value theories, are a group of theories that could provide those mediating processes (Atkinson & Birch, 1964; Feather, 1982; Raynor, 1982). Perhaps the exemplar of this group of theories is Vroom's (1964) expectancy theory. This theory suggests that trainees have preferences among the different outcomes that can result from participation in training (i.e., valence). Trainees also have expectations regarding the likelihood that effort invested in training will result in mastery of training content (i.e., expectancy). Past research has shown that expectancy theory is useful for predicting behavior when the behavior is under the employees' control, the work environment provides consistent contingent rewards, behavior–outcome linkages are unambiguous, and there is a limited time span between assessment of predictors and observation of a criterion (Mitchell, 1982). Because these conditions are usually met in a training context (e.g., attending training is under the employee's control and is purported to result in positive outcomes), this theory has frequently been used to understand training motivation (e.g., Mathieu & Martineau, 1997).

Many models of training motivation have combined need–motive–value and cognitive choice theories by using Expectancy × Value variables as mediators of individual characteristics. For example, Mathieu and Martineau's (1997) model of training motivation suggests that individual and situational characteristics impact training outcomes by affecting expectancy theory variables and training motivation. In terms of individual characteristics, Mathieu et al. (1993) suggested that achievement motivation was related to training outcomes through the mechanism of self-efficacy. Colquitt and Simmering (1998) presented a model in which conscientiousness related to training outcomes by affecting expectancy and valence. Noe (1986) posited that locus of control was related to training outcomes through the mechanism of expectancy. In terms of situational characteristics, Quinones (1995) posited that aspects of the training assignment related to training outcomes through the mechanism of self-efficacy. Finally, models by Mathieu and colleagues showed situational constraints relating to learning through the mechanisms of self-efficacy and motivation to learn (Mathieu et al., 1992, 1993).

Taking the constructs identified in our narrative review and arranging them in a manner consistent with need–motive–value and cognitive choice theory approaches to motivation yielded the theory shown in Figure 1. Figure 1 shows what constructs should predict training motivation and outcomes and also illustrates how and why those relationships could occur (Whetten, 1989). For example, a given personality variable (e.g., conscientiousness) can relate to motivation to learn by one of three intervening mechanisms: (a) by relating to self-efficacy, (b) by relating to the valence of training outcomes, or (c) by relating to job/career variables. Motivation to learn then goes on to relate to learning outcomes. The theory also shows that cognitive ability is indirectly related to learning through increased self-efficacy (Gist & Mitchell, 1992). It is also directly related to learning, consistent with Ree and Earles (1991) and Hunter (1986), who also meta-analytically tested a direct relationship with job performance (Hunter & Hunter, 1984). It is important to note that some variables in Figure 1 are italicized. As we describe in the *Method* section, italicized variables were not examined with enough frequency to be included in the path-analysis phase of this review.

Figure 1 is consistent with the majority of models presented in the literature for two reasons: (a) relationships between individual and situational variables and motivation are completely mediated by self-efficacy, valence, and job/career variables (e.g., Baldwin & Magjuka, 1997; Martocchio, 1992; Noe, 1986; Noe & Schmitt, 1986; Quinones, 1995), and (b) relationships between individual or situational variables and learning outcomes are completely mediated by motivation to learn (e.g., Baldwin et al., 1991; Baldwin & Magjuka, 1997; Clark et al., 1993; Mathieu et al., 1992, 1993; Noe & Wilk, 1993; Quinones, 1995). For this reason, we refer to Figure 1 as the *completely mediated model*. It also follows Kanfer's (1991) distal–proximal framework of motivational theories, in which variables more distal from performance (in this case, individual and situational characteristics) exert influences through more proximal variables.

A competing view suggests that complete mediation may not occur. For example, Katzell and Thompson (1990) presented an integrative model of work motivation that includes individual and situational characteristics. Although they posited that the influences of individual characteristics and attitudes on performance are completely mediated by motivation, they also contended that the influences of situational variables on performance are both direct and indirect. Some models in the training literature have followed this convention. For example, Facteau et al. (1995) reviewed a model in which support variables and task constraints influenced training transfer both directly and indirectly through motivation to learn. Similarly, Tracey et al. (1995) posited that climate and culture directly influenced posttraining behavior. Finally, Noe's (1986) model predicted a direct link between environmental favorability and results, in addition to the linkage with motivation to learn.

As with the situational variables, complete mediation may not be likely with individual characteristics. In contrast to the need–motive–value and cognitive choice conceptualization in Figure 1, other motivational theories have suggested that the effects of individual characteristics need not be completely mediated by more proximal variables. For example, Naylor, Pritchard, and Ilgen's (1980) theory viewed motivation as the proportion of personal resources devoted to a task and suggested that individual differences (which could include personality, ability, or demographics) create differences in total resource availability. In Naylor et al.'s (1980) schematic representation of the theory, the authors noted that "individual differences are assumed to be operating at each internal process stage in the theory" (p. 24). Individual characteristic effects are not fully mediated, nor do they occur at only one specific stage. Kanfer and Ackerman's (1989) resource allocation view of motivation has suggested a similar notion. Individual differences are purported to affect resource capacity, which affects the amount of resources that can be allocated throughout task activity. This suggests that individual differences should have effects during the entire training process, because resource allocation is important during learning, transfer, and posttraining job performance.

On the basis of the motivational theories developed by Katzell and Thompson (1990), Kanfer and Ackerman (1989), and Naylor et al. (1980), a *partially mediated* model is a feasible alternative to the completely mediated model shown in Figure 1. The partially
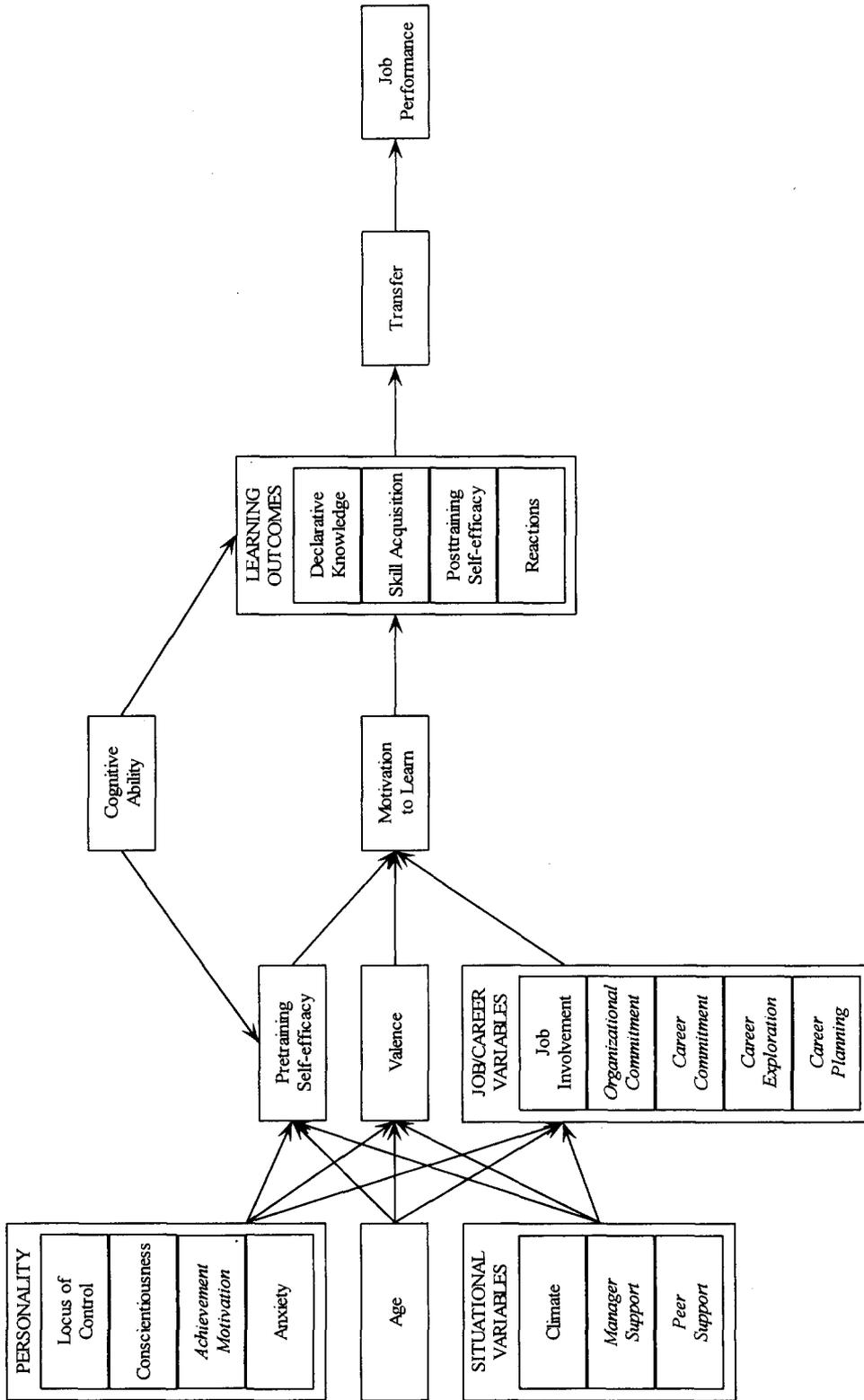
Figure 1. A completely mediated version of an integrative theory of training motivation. Italics indicate that variables were not examined with enough frequency to be included in path analysis.

mediated model is shown in Figure 2; in this model, the influences of individual and situational characteristics are not fully mediated by self-efficacy, valence, and job/career variables. Rather, distal influences are assumed to operate at each stage of the model, as is made evident by the links to self-efficacy, valence, job/career variables, motivation to learn, learning outcomes, transfer, and job performance. Thus, Figure 2 takes Figure 1 and adds paths from each of the exogenous variables to each of the endogenous variables. As a result, the model in Figure 1 is nested within the model in Figure 2.

Several studies of training motivation have supported this alternative structure. For example, Colquitt and Simmering (1998) showed that the relationship between conscientiousness and declarative knowledge was only partially mediated by motivation to learn. In Silver, Mitchell, and Gist's (1995) study, locus of control was more highly related to skill acquisition than it was to pretraining self-efficacy, suggesting that self-efficacy could only be (at best) a partial mediator of the locus of control–skill acquisition linkage. Finally, in Birdi et al. (1997), age was more highly related to motivation to learn than it was to organizational commitment or perceived job-related benefits, suggesting that job/career variables and valence could only partially mediate the age–motivation to learn relationship.

Figures 1 and 2 present two competing, though preliminary, integrative theories of training motivation. The remainder of this article uses meta-analysis to estimate the corrected values of the relationships embedded within these two theories. Those values are then used as the inputs to a series of path analyses, which are
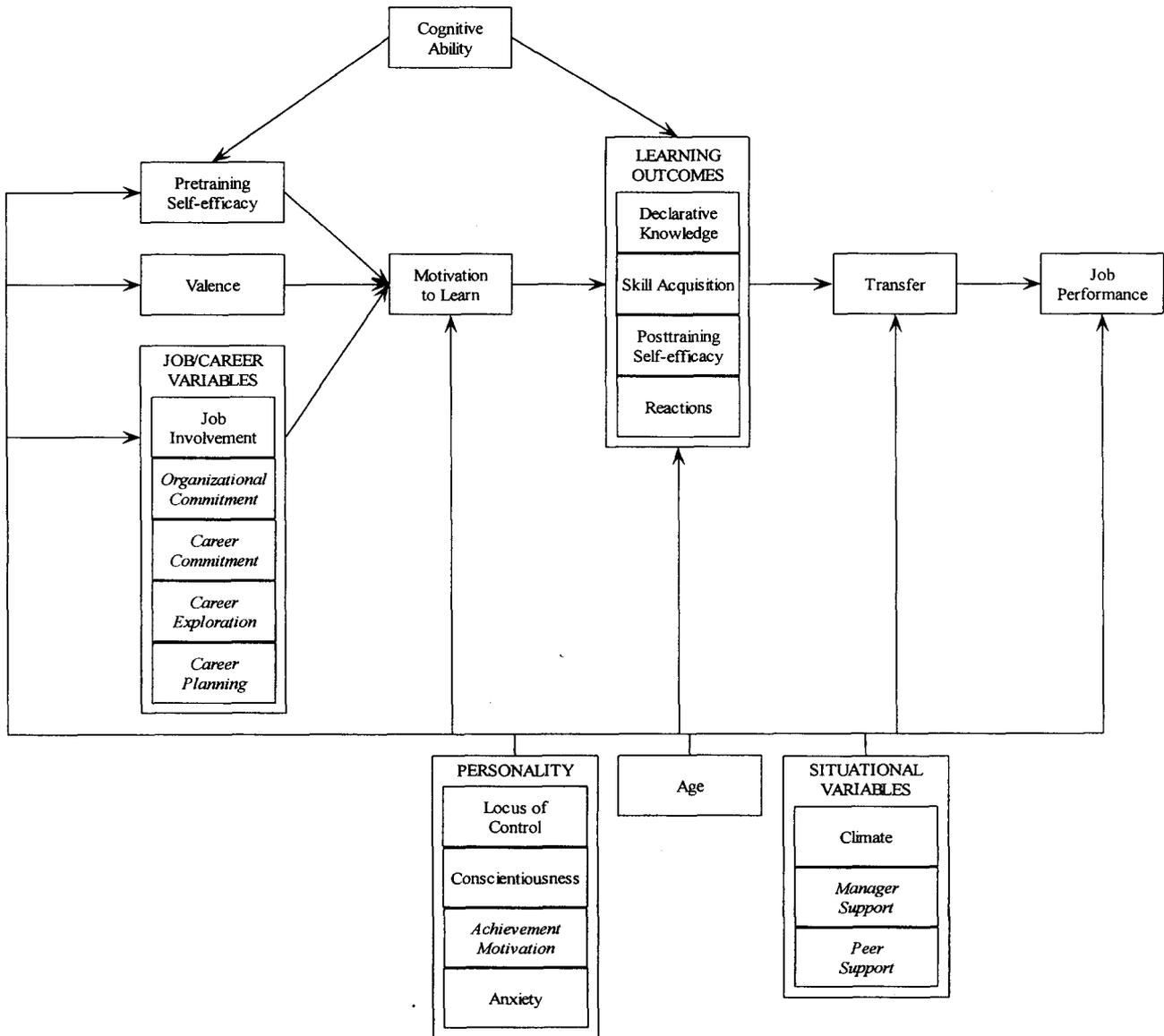

Figure 2. A partially mediated version of an integrative theory of training motivation. Italics indicate that variables were not examined with enough frequency to be included in path analysis.

used to test the feasibility of each of the two theories for explaining training motivation and effectiveness.

Method

Literature Search

To meta-analyze the relationships shown in Figures 1 and 2, we conducted an extensive literature search. Specifically, all three of us jointly performed manual searches of the following journals: *Journal of Applied Psychology, Personnel Psychology, Academy of Management Journal, Organizational Behavior and Human Decision Processes, Administrative Sciences Quarterly, Journal of Management, Journal of Organizational Behavior, Journal of Vocational Behavior, Journal of Organizational and Occupational Psychology, Human Relations, Training Research Journal, Human Resource Development Quarterly, Group and Organization Management, Journal of Personality and Social Psychology, Psychological Reports, Journal of Educational Psychology* (adult samples only), and *Journal of Experimental Education* (adult samples only). Education journals were included because of their relevance to issues such as training motivation and learning. We conducted searches on articles published since 1975. We felt that articles before this date would be less likely to focus on the constructs in Figures 1 and 2 and would be unlikely to report meta-analyzable effect sizes. We also mailed letters to several training researchers to gather applicable works that were in press or under review. Articles in journals other than those listed above were only included if they were received in this mailing process or were in the possession of one of us before the search was conducted. Exceptions were articles included in Alliger et al.'s (1997) meta-analysis of the relationships among training outcomes (i.e., reactions, learning, and transfer), which we included in our study for comparative purposes.

We copied any article that included at least one construct in the models shown in Figures 1 and 2. At this stage of the literature search, our decision rules were intentionally biased in a Type I direction. That is, we were much more likely to copy an article that was not relevant than to fail to copy an article that was relevant. This initial search left us with 256 articles. The next step was to judge which of the 256 articles could truly yield codable information. The criteria for an article to be considered codable were as follows. First, the article had to include at least one relationship embedded in the models shown in Figures 1 and 2. Thus, an article that investigated, for example, the relationship between need for affiliation and job involvement would be omitted. Although job involvement was in Figure 1, the need for affiliation–job involvement relationship was not. Second, the article had to either measure learning, training, or skill development or have as its sample individuals undergoing such activities. This was a critical issue. Training motivation differs from general motivation in terms of its context and its correlates. The training context differs from contexts in which general job performance is assessed because the task content is necessarily new and often complex. Although it is true that some correlates of training motivation may not be context sensitive (e.g., valence, self-efficacy), other correlates could be either more critical or more relevant in a training context (e.g., age, anxiety, career exploration). Still other correlates do not exist outside of training settings (e.g., transfer climate).

Thus, the articles in our sample that referenced self-efficacy assessed one's capacity to learn the training material. Likewise, valence was referenced toward the value of training, and job performance was referenced toward the posttraining performance levels of trainees. For example, we included the self-efficacy–performance correlation from Martocchio and Judge (1997) because the context of their study was computer training and efficacy was referenced toward the training material. Conversely, the expectancy–performance correlation from Gellatly (1996) was not included because expectancy was referenced to a simple arithmetic task for which no training or learning was required.

To judge codability, the three of us formed three dyads and assessed whether each article could yield codable information. The 256 articles were split into thirds, with each dyad in charge of one of the thirds. The authors of each dyad first reviewed their dyad's articles alone, judging each to be codable or not codable. The dyads then came together to compare notes and make a final decision on codability. Because of the subjectivity and judgment calls inherent in meta-analytic efforts (e.g., Wanous, Sullivan, & Malinak, 1989), we felt that all decisions should require the consensus of both dyad members. Where author dyad disagreements could not be resolved, the third author was brought in to help reach a consensus decision. Five of the 256 articles necessitated such a step, with concerns normally pertaining to construct validity issues and the ability to obtain relevant effect sizes from the reported results.

The individual members of the dyads for the most part agreed on codability. Agreement levels for the dyads were high, with specific levels of 81% (representing agreement on 68 of 85 articles), 91% (77 of 85), and 98% (84 of 86), for an overall average of 90% agreement. A total of 106 articles were eventually categorized as codable. These articles are represented in the *References* section with an asterisk. Forty-four of the studies were field studies in business organizations, 21 were military field studies, and 41 were laboratory studies.

Meta-Analytic Methods

Meta-analysis is a technique that allows individual study results to be aggregated while correcting for various artifacts that can bias relationship estimates. Our meta-analyses were conducted using Hunter and Schmidt's (1990) procedures. Table 1 shows the correlation matrix needed to analyze the models shown in Figures 1 and 2. Each cell in Table 1 represents one individual meta-analysis; thus, the table is the culmination of over 100 individual meta-analyses. Inputs into the meta-analyses include effect size estimates in the form of correlations, along with sample sizes and reliability information for both variables.

In cases in which a variable was assessed with multiple measures, we acted in accordance with Hunter and Schmidt's (1990) recommendations for conceptual replication (see pp. 451–463). Specifically, when the multiple measures were highly correlated and seemed to each be construct valid, we employed the formulas for correlations of variables with composites (see Hunter & Schmidt, 1990, p. 457). Thus, one composite correlation was computed in lieu of the multiple correlations, preventing a study employing multiple measures from being "double counted." This technique improves both reliability and construct validity and results in more accurate estimates than the more popular method of averaging the correlations. In cases in which composites were employed, we calculated the reliability of the composite using the Spearman–Brown formula (see Hunter & Schmidt, 1990, p. 461). In some cases, the multiple measures were uncorrelated with each other. When this occurred, we collectively decided which of the multiple measures seemed to be most construct valid and used that as the variable's measure. Furthermore, in cases in which several measures were used, it was sometimes the case that four or five measures were highly related, whereas the other one or two were not. In these cases, we formed composites using only the highly related measures. We also note that when an article reported results from multiple independent samples, each correlation was included in the meta-analysis. Thus, Noe and Wilk (1993) contributed three correlations between valence and pretraining career exploration, one each for their health maintenance organization, engineering, and bank samples (see Hunter and Schmidt's, 1990, section on analysis of subgroups for a discussion of these issues, pp. 463–466).

Meta-analysis requires that each observed correlation from a given study be weighted by that study's sample size to provide a weighted mean estimate of the correlation. The standard deviation of this estimate across the multiple studies is also computed. This variation is composed of true variation in the correlation values as well as variation due to artifacts such as sampling error and measurement error. To provide a more accurate estimate of each correlation and its variability, our analyses corrected for

Table 1

Meta-Analytic Correlation Values for Antecedents and Outcomes of Training Motivation

	Locus of control		Achievement motivation		Conscientiousness	
	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
(1) Locus of control	—	—				
k, N	—	—				
(2) Ach motivation	.18, .26 (−.03, .38)	.18* (.18)	—	—		
k, N	2	433	—	—		
(3) Conscientiousness	−.24, −.37 (−.52, .04)	.25* (.20)	.59, .66	—	—	—
k, N	2	249	1	106	—	—
(4) Anxiety					−.33, −.40	
k, N					1	93
(5) Job involvement	−.09, −.13		.33, .44 (.19, .48)	.13* (.11)	.29, .38 (.17, .41)	.00 (.00)
k, N	1	58	2	364	2	417
(6) Org commit			.37, .47			
k, N			1	202		
(7) Career commit	.27, .34 (.14, .40)	.00				
k, N	2	190				
(8) Career planning	.16, .21		.57, .72			
k, N	1	60	1	141		
(9) Career explor	.17, .22					
k, N	1	58				
(10) Self-eff (pre)	−.02, −.03 (−.21, .16)	.27* (.14)	.08, .11 (.01, .16)	.00 (.02)	.23, .28 (.15, .31)	.00 (.05)
k, N	6	899	3	648	5	563
(11) Valence	−.10, −.15 (−.22, .03)	.00 (.08)	.33, .42 (.23, .43)	.00 (.04)	.16, .20 (.06, .26)	.08* (.07)
k, N	2	249	3	325	4	822
(12) Sup support						
k, N						
(13) Peer support	.00, .00					
k, N	1	118				
(14) Pos climate	.16, .21 (.03, .29)	.00 (.01)	−.04, −.05 (−.23, .14)	.15* (.12)		
k, N	2	199	2	356		
(15) Cog ability	.07, .08		−.03, −.04		−.07, −.09 (−.01, −.12)	.04 (.03)
k, N	1	330	1	330	8	1690
(16) Age	−.11, −.12				.04, .04	
k, N	1	392			1	483
(17) Motiv to learn	−.33, −.46 (−.62, −.05)	.28* (.19)	.27, .35 (.02, .53)	.27* (.22)	.31, .38 (.15, .48)	.14* (.10)
k, N	3	309	2	244	3	388
(18) Decl knowledge	.16, .21 (.06, .27)	.15* (.08)	.05, .07 (−.03, .13)	.00 (.03)	−.01, −.01 (−.16, .13)	.14* (.10)
k, N	7	924	4	610	3	725
(19) Skill acquisition	.03, .04 (−.08, .15)	.09 (.07)	.13, .17 (−.11, .37)	.20* (.15)	−.04, −.05 (−.15, .06)	.13* (.07)
k, N	7	386	2	356	6	839
(20) Reactions	.15, .18 (−.02, .32)	.00 (.06)	.15, .20 (.07, .23)	.00 (.05)	−.05, −.06	
k, N	2	125	3	558	1	139
(21) Self-eff (post)	.00, .00 (−.27, .27)	.35* (.17)	.18, .22 (.07, .28)	.05 (.09)	.16, .19	
k, N	5	309	2	318	1	82
(22) Transfer	.19, .27 (.02, .36)	.00 (.04)			.27, .29	
k, N	2	125			1	80
(23) Job performance	.25, .35		.34, .39			
k, N	1	44	1	141		

Note. Asterisks indicate cases where artifacts explained less than 60% of the variance in r_c, suggesting the existence of moderators. r = uncorrected meta-analytic correlation; r_c = correlation corrected for unreliability; 95% CI = 95% confidence interval around r; SDr_c = standard deviation of the corrected correlations across all studies in each meta-analysis; Bt SE = bootstrap standard errors of each meta-analytic correlation; Ach motivation = achievement motivation; Org commit = organizational commitment; Career commit = career commitment; Career explor = career exploration; Self-eff (pre) = pretraining self-efficacy; Sup support = supervisor support; Pos climate = positive climate; Cog ability = cognitive ability; Motiv to learn = motivation to learn; Decl knowledge = declarative knowledge; Self-eff (post) = posttraining self-efficacy.

both sampling error and unreliability. Where complete reliability information was available for each correlation in a given meta-analysis, we performed the analysis using correlations corrected individually for unreliability. However, where reliability information was only sporadically available, the method of artifact-distribution meta-analysis was performed (Hunter & Schmidt, 1990). In these cases, a weighted mean reliability was used to correct for measurement error, on the basis of the studies that did report reliability information.

Table 1 provides both uncorrected (r) and corrected (r_c) estimates of the meta-analytic correlation. The latter are corrected for unreliability in both variables. The 95% confidence intervals for each correlation are also provided. Confidence intervals were generated using the standard error of the weighted mean correlation. Confidence intervals reflect the "extent to which sampling error remains in the estimate of a mean effect size" (Whitener, 1990, p. 316) and were applied to estimates not corrected for unreliability. If a confidence interval does not

Anxiety		Job involvement		Org commit	
r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
—	—				
—	—	—	—		
—	—	—	—	—	—
				.41, .47 (.36, .45)	.00 (.01)
				3	1298
		.14, .18 (.03, .25)	.00 (.05)	.35, .42	
		3	307	1	967
		.15, .25 (.10, .20)	.00 (.07)	.03, .04	
		2	1418	1	967
−.30, −.34 (−.45, −.15)	.26* (.08)	.07, .11		.12, .15 (−.01, .25)	.13 (.10)
10	1342	1	1360	3	2035
−.29, −.32		.14, .20 (.09, .19)	.00 (.02)	.35, .41 (.31, .40)	.00 (.03)
1	106	2	1501	2	2212
		.13, .19 (.08, .17)	.00 (.00)	.38, .44 (.27, .49)	.14* (.07)
		2	1815	5	3302
		.08, .12		.29, .35 (.14, .44)	.15* (.10)
		1	1360	3	2722
		.21, .28 (.09, .32)	.17* (.13)	.27, .33 (.09, .45)	.21* (.12)
		4	2062	4	2449
.29, .35		−.13, −.17 (−.04, −.23)	.00 (.05)	−.16, −.20	
1	105	2	417	1	666
.13, .14 (.03, .23)	.06 (.06)			.11, .12 (.01, .21)	.09* (.06)
5	483			3	2303
−.52, −.57 (−.72, −.32)	.17* (.11)	.16, .20 (.05, .27)	.00 (.03)	.41, .47 (.34, .49)	.06* (.05)
3	242	3	305	3	2878
−.14, −.17 (−.27, −.01)	.19* (.09)	−.16, −.18 (−.33, .01)	.12* (.11)	−.10, −.12	
8	1070	2	247	1	666
−.13, −.15 (−.23, −.03)	.00 (.05)	−.11, −.13 (−.31, .10)	.19* (.15)	.01, .01	
4	368	3	291	1	666
−.21, −.23 (−.35, −.07)	.00 (.07)	.04, .05 (−.12, .20)	.17* (.12)	.30, .36 (.08, .52)	.19* (.25)
2	174	4	514	2	868
−.42, −.47 (−.55, −.28)	.00 (.01)			.17, .20 (.10, .24)	.00 (.02)
2	144			2	790
		.25, .39		.34, .45 (.29, .39)	.00 (.04)
		1	44	2	1206
.11, .12		.06, .07 (−.06, .19)	.00 (.03)	.22, .26 (.14, .29)	.00 (.02)
1	106	2	246	2	586

(table continues)

include the value of 0, that correlation can be judged to be statistically significant.

Table 1 also presents the standard deviation of the corrected correlations (SDr_c). This provides an index of the variation in the corrected values across the studies in our sample. One indication that moderators may be present in a given relationship is when artifacts such as unreliability fail to account for a substantial portion of the variance in correlations. Hunter and Schmidt (1990) have suggested that if artifacts fail to account for 75% of the variance in the correlations, moderators likely exist. Mathieu and Zajac (1990) and Hom, Caranikas-Walker, Prussia, and Griffeth (1992) amended the 75% to 60% in cases where range restriction is not one of the artifacts that is corrected for. Thus, in Table 1, standard deviations of corrected correlations are marked with

an asterisk where artifacts do not account for 60% of the variance in the correlations. We note that the 60% rule only implies the existence of a moderator—it does not indicate what variable is acting as the moderator. Investigating moderator variables was outside the scope of the present study because of the sheer number of relationships being examined as well as the use of meta-analytic path analysis as a follow-up to the meta-analyses. Indeed, a search for even one type of moderator would require (approximately) an additional 300 meta-analyses, as each relationship in Figures 1 and 2 would be meta-analyzed at each level of the moderator. Many cells in Table 1 do not include enough studies for such a breakdown. Nonetheless, we felt that illustrating where moderators may be present would make our results as informative as possible and identify directions for future research.

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Table 1 (*continued*)

	Career commit		Career planning		Career explor	
	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
(1) Locus of control						
k, N						
(2) Ach motivation						
k, N						
(3) Conscientiousness						
k, N						
(4) Anxiety						
k, N						
(5) Job involvement						
k, N						
(6) Org commit						
k, N						
(7) Career commit	—	—				
k, N	—	—				
(8) Career planning			—	—		
k, N			—	—		
(9) Career explor			.21, .30 (.14, .28)	.21* (.11)	—	—
k, N			2	1025	—	—
(10) Self-eff (pre)					.29, .38 (.25, .33)	.05* (.05)
k, N					4	2368
(11) Valence			.26, .32 (.20, .31)	.00 (.06)	.28, .34 (.21, .36)	.09* (.06)
k, N			2	1108	5	3325
(12) Sup support	.26, .29		.12, .14		.00, .00 (−.03, .04)	.00 (.00)
k, N	1	396	1	967	2	2327
(13) Peer support	.18, .21 (.11, .26)	.00 (.02)	.22, .22		.07, .09 (−.01, .14)	.06* (.05)
k, N	2	628	1	967	2	2327
(14) Pos climate	.22, .26 (.14, .29)	.00 (.04)	.01, .01 (−.22, .23)	.16* (.14)	.14, .18 (.06, .22)	.11* (.08)
k, N	2	628	2	628	4	2368
(15) Cog ability						
k, N						
(16) Age	.28, .29					
k, N	1	392				
(17) Motiv to learn			.24, .36 (.17, .31)	.21* (.08)	.21, .25 (.10, .32)	.14* (.08)
k, N			4	1274	5	2033
(18) Decl knowledge	.01, .01		.01, .02 (−.11, .14)	.00 (.01)		
k, N	1	118	2	247		
(19) Skill acquisition			.11, .14 (−.05, .28)	.14* (.11)	.06, .06	
k, N			3	291	1	44
(20) Reactions			.12, .14 (.00, .23)	.00 (.04)	.34, .42 (.25, .43)	.10* (.07)
k, N			3	291	4	1052
(21) Self-eff (post)						
k, N						
(22) Transfer			.22, .30 (.12, .31)	.04 (.18)	.16, .22 (.06, .27)	.06 (.20)
k, N			2	1011	2	1011
(23) Job performance	.03, .04		.20, .23 (.06, .34)	.00 (.02)	−.19, −.26	
k, N	1	510	2	185	1	44

Finally, Table 1 presents the bootstrap standard errors of the meta-analyzed correlations. Bootstrapping is a resampling procedure, conducted using a computer simulation, that evaluates how well a parameter is estimated by computing a standard error (Switzer, Paese, & Drasgow, 1992). When applied to meta-analysis, bootstrapping entails estimating the meta-analytic correlation by sampling, with replacement, k observations from the k studies included in the meta-analysis and repeating that process over thousands of iterations. Sampling with replacement means that each study has probability $1/k$ of being selected for the sample of a given iteration, so some studies may be represented in a given sample multiple times, whereas other studies may not be represented at all. The bootstrap standard error is then computed as the standard deviation of the iterations' estimates. It provides an index of the uncertainty of the parameter estimate (Switzer et al., 1992). Bootstrap standard errors are reduced by having a large number of studies in a given meta-analysis and also by having a large number of observations per correlation.

Huffcutt and Arthur (1995) noted that, as in primary studies, the influence of outliers on meta-analysis results should be assessed. In meta-analytic investigations, outliers consist of primary study correlation coefficients that are inconsistent with other coefficients. Such outliers may be a function of errors in data collection or computation, unique facets of the sample, or extreme sampling error, and they can impact the corrected correlation value and the residual variability in the corrected correlation. As meta-analytic data were being coded, author dyads noted cases in which outliers seemed to be especially influential. These cases normally corresponded to situations in which a correlation was similar in magnitude but opposite in sign to all the other correlations, and a sufficient number of other studies (and convergence of those other studies) existed to illustrate the uniqueness of the outlier value.

The most substantive of these cases was the training motivation-declarative knowledge meta-analysis, for which the value from Tannenbaum et al. (1991) was −.23, whereas the weighted mean uncorrected

Self-eff (pre)		Valence		Sup support	
r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
—	—				
—	—				
.20, .24 (.13, .28)	.13* (.05)	—	—		
11	4,809	—	—		
.10, .12 (.03, .17)	.07* (.05)	.34, .40 (.29, .39)	.04 (.03)	—	—
4	3,307	6	4519	—	—
.22, .27 (.03, .41)	.16* (.11)	.29, .35 (.19, .40)	.13* (.07)	.33, .39 (.17, .49)	.19* (.10)
2	2,605	4	3,817	4	3,817
.19, .23 (.13, .25)	.08* (.05)	.29, .53 (.26, .32)	.14 (.14)	.33, .41 (.26, .40)	.10* (.07)
7	4,124	6	3,754	5	3,100
.22, .26 (.16, .28)	.00 (.04)	.18, .22 (.00, .35)	.14* (.14)	.04, .05	
8	987	2	573	1	180
−.19, −.21 (−.14, −.24)	.04 (.15)	−.06, −.07 (−.02, −.12)	.03 (.04)	.25, .29	
7	1,792	4	2,124	1	1,245
.36, .42 (.29, .43)	.14* (.05)	.52, .61 (.45, .59)	.12* (.04)	.31, .36 (.27, .33)	.00 (.02)
14	4,143	14	4,581	5	2,933
.25, .30 (.19, .32)	.13* (.04)	.16, .20 (.06, .25)	.00 (.06)	.20, .25 (.06, .34)	.00 (.04)
16	2,806	3	383	4	181
.26, .32 (.19, .33)	.17* (.06)	.24, .30 (.14, .33)	.00 (.01)	.24, .29	
20	2,745	3	386	1	43
.14, .17 (.08, .19)	.08* (.04)	.43, .53 (.30, .56)	.18* (.07)	.11, .15 (−.05, .27)	.05 (.04)
14	2,783	6	1,394	4	181
.52, .59 (.44, .60)	.14* (.07)			.45, .53	
8	1,347			1	180
.33, .47		.62, .70		.33, .43 (.03, .63)	.26* (.26)
1	68	1	967	2	1,206
.19, .22 (.05, .33)	.00 (.04)	.04, .04 (−.08, .17)	.00 (.04)	−.07, −.08	
2	182	2	247	1	62

(table continues)

correlation from the other 11 studies was .23. Huffcutt and Arthur (1995) provided the computation for an outlier influence statistic (the sample-adjusted meta-analytic deviancy statistic, or SAMD) based on the difference between an outlier's effect size and the effect size of the other studies. The SAMD value, which approximates a t-distribution, was 11.50. The age–declarative knowledge analysis also seemed to possess an especially prominent outlier, and the study was again Tannenbaum et al. (1991). In this case, the SAMD value was 6.40 (a value of .15 vs. a weighted average of 7 studies of −.17). Tannenbaum et al.'s (1991) study took place in an 8-week military naval recruit socialization setting, the only military study in the two analyses. The authors noted that their sample ($N = 666$) represented the 70% of the recruits that completed the 8 weeks, and they further noted that those 666 recruits were significantly more motivated and significantly younger than the 267 that did not complete the training. Thus, there was a restriction of range on the two variables that ended up being identified as outlier relationships. Also, Tannenbaum et al. (1991) noted that training motivation was the only variable that declined during the training program, suggesting that some facet of the program harmed motivation levels (the authors speculated that this effect might be idiosyncratic to recruit training). Because of its unique setting, the significant age and motivation attrition, and the highly significant SAMD values, Tannenbaum et al. (1991) was not included in the training motivation–declarative knowledge and age–declarative knowledge meta-analyses.

Meta-Analytic Path Analysis

Many questions cannot be answered by a matrix of meta-analyzed correlations. For example, does motivation to learn explain variance in

Table 1 (continued)

	Peer support		Pos climate		Cog ability	
	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
(1) Locus of control k, N						
(2) Ach motivation k, N						
(3) Conscientiousness k, N						
(4) Anxiety k, N						
(5) Job involvement k, N						
(6) Org commit k, N						
(7) Career commit k, N						
(8) Career planning k, N						
(9) Career explor k, N						
(10) Self-eff (pre) k, N						
(11) Valence k, N						
(12) Sup support k, N						
(13) Peer support k, N	— —	— —				
(14) Pos climate k, N	.27, .34 (.20, .34) 5	.09* (.04) 3,337	— —	— —		
(15) Cog ability k, N			.04, .05 1	180	—	—
(16) Age k, N	.00, .00 1	1,245	−.07, −.08 1	1245	−.07, −.08 (−.15, .00) 2	.00 (.02) 658
(17) Motiv to learn k, N	.31, .37 (.23, .40) 3	.08* (.06) 2,457	.32, .39 (.26, .39) 7	.08* (.06) 2576	−.13, −.15 (−.32, .06) 3	.19* (.16) 926
(18) Decl knowledge k, N	.00, .00 (−.11, .11) 3	.00 (.05) 303	.11, .14 (.01, .21) 5	.07* (.05) 545	.58, .69 (.45, .71) 12	.27* (.16) 6737
(19) Skill acquisition k, N			.14, .18 (.07, .21) 4	.00 (.02) 758	.32, .38 (.26, .38) 17	.14* (.07) 6713
(20) Reactions k, N	.04, .05 1	81	.32, .40 (.22, .42) 7	.15* (.06) 1546	−.08, −.10 (−.16, .00) 4	.06 (.05) 1149
(21) Self-eff (post) k, N			.49, .57 1	180	.18, .22 (.03, .33) 3	.14* (.13) 928
(22) Transfer k, N	.62, .84 (.46, .77) 3	.00 (.18) 1,152	.27, .37 (−.11, .65) 3	.44* (.26) 525	.32, .43 (.15, .49) 3	.12 (.12) 310
(23) Job performance k, N	.11, .13 1	510	.21, .26 (.14, .29) 2	.00 (.02) 651		

declarative knowledge beyond cognitive ability? Which variables have higher independent relationships with motivation to learn: job/career variables or self-efficacy? Do personality variables explain variance in training outcomes over and above the more proximal variables? These questions can only be answered by examining the theoretical structures of the models shown in Figures 1 and 2. To assess the ability of Figures 1 and 2 to form an integrative theory of training motivation, it is important to identify whether the theoretical structures of the models adequately specify relationships among variables in a way that helps explain the phenomenon (Kerlinger, 1996). That is, do those structures correctly specify what constructs are related, how they are related, and why (Whetten, 1989)?

Traditionally, scientists concerned with building and testing theories have used path-analytic procedures in which models are compared with correlations observed from empirical testing. To the extent that the observed correlations fit the structure inherent in the model, the data

fail to reject the scientist's theory. Unfortunately, there has been little integration of path-analytic procedures with meta-analytic techniques for yielding corrected correlations. That has changed recently, however, as meta-analytic path analysis has been used to test theories of leadership (Podsakoff, MacKenzie, & Bommer, 1996), turnover (Hom et al., 1992), job satisfaction (Brown & Peterson, 1993), and job performance (Schmidt, Hunter, & Outerbridge, 1986). There has also been a review article discussing the merits of the technique (Viswesvaran & Ones, 1995).

In practice, there are some decision points that researchers employing this technique encounter (Viswesvaran & Ones, 1995). First, many researchers, particularly those analyzing a matrix the size of Table 1, find cells that lack correlations. Out of the 253 cells in Table 1, 54 (21%) were empty. Strategies for addressing this issue include collecting primary data to fill the cell, using the average correlation in the matrix as a replacement

Age		Motiv to learn		Decl knowledge	
r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
—	—				
—	—				
−.18, −.18 (−.05, −.30)	.15* (.11)	—	—		
5	2,153	—	—		
−.17, −.19 (−.24, −.10)	.07 (.10)	.23, .27 (.16, .30)	.11* (.12)	—	—
8	1,774	11	1,509	—	—
−.03, −.03 (−.18, .11)	.19* (.12)	.13, .16 (.01, .25)	.20* (.10)	.44, .55 (.36, .52)	.18* (.09)
6	1,047	9	1,615	16	5,309
.02, .02 (−.15, .18)	.20* (.13)	.38, .45 (.32, .44)	.11* (.05)	.08, .10 (.03, .13)	.13* (.05)
5	1,167	12	2,517	26	4,520
−.30, −.32 (−.45, −.15)	.00 (.02)	.17, .18 (.09, .25)	.04 (.09)	.26, .31 (.14, .38)	.19* (.09)
2	144	2	734	9	1,120
.01, .01		.44, .58 (.38, .50)	.00 (.11)	.28, .38 (.17, .40)	.23* (.08)
1	68	2	1,011	14	1,369
−.04, −.04		.06, .07 (−.06, .17)	.00 (.03)	−.03, −.04 (−.15, .10)	.00 (.04)
1	106	3	291	2	243

(table continues)

for the missing value, or having subject-matter experts estimate the correlation. Second, the sample sizes of the cells in the correlation matrix can vary, raising a question about what sample size to use when computing the standard errors associated with the path coefficients. Potential solutions include using the mean sample size or limiting oneself to only those articles that assess every relationship in the model, meaning that sample size will be constant across cells. A related issue is whether to test the entire model in one global analysis, as in structural equation modeling, or use a series of path analyses, in which case the model is tested one segment at a time. The former option forces the researcher to choose one single sample size for the analysis (see Hom et al., 1992; Brown & Peterson, 1993). The latter allows the researcher to tailor the sample size to the model segment (see Podsakoff et al., 1996; Schmidt et al., 1986). Finally, the researcher must choose whether to use maximum-likelihood estimation (the choice of Hom et al.,

1992, and Brown & Peterson, 1993), ordinary least squares (OLS; the choice of Podsakoff et al., 1996, and Schmidt et al., 1986), or some other method.

We dealt with these decision points in the following manner. To deal with the issue of cells that were missing correlations, we trimmed the full correlation matrix in Table 1 by eliminating variables with either a large number of missing relationships or a large number of relationships based on only a single study. However, in doing so, we ensured that none of the construct categories in Figures 1 and 2 (e.g., personality, job/career variables) were eliminated. That is, whereas we eliminated organizational commitment, career commitment, career planning, and career exploration, we retained job involvement, allowing us to test the job/career variables aspect of Figures 1 and 2. Similarly, whereas supervisor and peer support were eliminated, positive climate was retained, allowing us to examine

Table 1 (continued)

	Skill acquisition		Reactions	
	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
(1) Locus of control k, N				
(2) Ach motivation k, N				
(3) Conscientiousness k, N				
(4) Anxiety k, N				
(5) Job involvement k, N				
(6) Org commit k, N				
(7) Career commit k, N				
(8) Career planning k, N				
(9) Career explor. k, N				
(10) Self-eff (pre) k, N				
(11) Valence k, N				
(12) Sup support k, N				
(13) Peer support k, N				
(14) Pos climate k, N				
(15) Cog ability k, N				
(16) Age k, N				
(17) Motiv to learn k, N				
(18) Decl knowledge k, N				
(19) Skill acquisition k, N	— —	— —		
(20) Reactions k, N	.07, .09 (.03, .11) 15	.00 (.03) 2,261	— —	— —
(21) Self-eff (post) k, N	.33, .40 (.21, .45) 13	.24* (.12) 1,484	.09, .10 (−.01, .18) 5	.10* (.07) 1,008
(22) Transfer k, N	.50, .69 (.23, .78) 8	.49* (.18) 604	.08, .11 (.02, .14) 9	.00 (.04) 951
(23) Job performance k, N	.36, .44 (.22, .50) 3	.10* (.09) 291	.27, .29 (.08, .46) 3	.18* (.12) 291

situational characteristic effects. Achievement motivation was eliminated, but the personality variables of locus of control, conscientiousness, and anxiety were retained. We therefore felt that eliminating those seven variables allowed us to retain the scope of Figures 1 and 2 while at the same time improving their parsimony considerably (Bacharach, 1989; Whetten, 1989). Moreover, the fact that the structures of Figures 1 and 2 were maintained when the seven variables were trimmed lessens the possibilities of an unmeasured variable problem (James, 1980). James (1980) argued that trade-offs occur in which known causes within a causal system can be omitted for the sake of parsimony, particularly when the omitted cause is somewhat redundant with an included variable. It is important to note that the seven omitted variables are the same variables italicized in Figures 1 and 2.

The trimmed correlation matrix had 120 cells and only 10 empty cells. Where possible, we filled the 10 missing cells in the trimmed matrix using

past research outside of the domain of training or learning (i.e., outside the boundary condition for inclusion in our study). For example, job involvement has not been correlated with age, anxiety, or posttraining self-efficacy in a study that assessed learning or skill acquisition or used as its sample participants who engaged in a learning activity. However, we were able to use the job involvement meta-analysis by Brown (1996) to fill in missing cells, with the age–job involvement link being filled with $r_c = .16$ and the anxiety–job involvement link being filled with $r_c = .11$. We set the posttraining self-efficacy–job involvement link equal to the correlation with pretraining self-efficacy (.11). Likewise, the posttraining self-efficacy–valence link was set equal to the correlation with pretraining self-efficacy (.24). The cognitive ability–job performance corrected correlation of .30 from Hartigan and Wigdor's (1989) National Academy of Sciences report was used, as was the conscientiousness–job performance corrected correlation of .22 from Barrick and Mount's (1991)

Self-eff (post)		Transfer		Job performance	
r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)	r, r_c (95% CI)	SDr_c (Bt SE)
—	—				
.38, .50 (.21, .56)	.08 (.11)	—	—		
3	172				
.13, .14		.45, .59 (.31, .59)	.00 (.10)	—	—
1	76	2	146	—	—

meta-analysis. Finally, the locus of control–anxiety correlation of .16 from Brosschot, Gebhardt, and Godaert (1994) was used. The conscientiousness–positive climate correlation was set equal to the achievement motivation–positive climate correlation (−.05), given that achievement motivation is a facet of conscientiousness, according to the Big Five taxonomy (McCrae & Costa, 1987). Similarly, the anxiety–positive climate correlation was set to −.10. Finally, the correlation between anxiety and transfer was set to −.10 on the basis of its correlations with declarative knowledge (−.17) and skill acquisition (−.15).

We dealt with the choice-of-sample-size issue in two ways. First, we elected to use a series of path analyses rather than global model estimation. This allowed us to tailor our choice of sample size to each specific segment of the model. For example, the sample size for the regression of motivation to learn on self-efficacy, valence, and job involvement was based only on the cells of the correlation matrix containing those relationships, so it was much more representative than a sample size based on the entire matrix would have been. Second, we chose to use the harmonic mean of the matrix sample sizes rather than the arithmetic mean. The formula for the harmonic mean is $k/(1/N_1 + 1/N_2 + \ldots + 1/N_k)$, where k refers to the number of study correlations and N refers to the sample sizes of the studies. An inspection of the formula shows that the harmonic mean gives much less weight to substantially large individual study sample sizes and so is always more conservative than the arithmetic mean (Viswesvaran & Ones, 1995). We note that we did accompany the path analysis with one omnibus test of global model fit. Specifically, we analyzed the sum of the squared residuals derived from comparing the actual correlation matrix with the matrix reproduced using the models' structural equations. The sum of the squared residuals is distributed as a chi-square, and the harmonic mean of the entire correlation matrix ($N = 285$) was used to test the chi-square's statistical significance.

In terms of the choice of estimation method, we elected to use OLS estimation, consistent with Podsakoff et al. (1996) and Schmidt et al. (1986). OLS assumptions are less restrictive than maximum likelihood, which assumes multivariate normality of all manifest variables. Maximum-likelihood estimation is also less optimal when the data is in the form of correlations rather than covariances (Cudeck, 1989). We note, however, that we conducted a follow-up analysis using the diagonally weighted least squares estimation method in LISREL 8.0 (Jöreskog & Sörbom, 1996). This analysis used the squared bootstrap standard errors as the asymptotic variances and produced results remarkably similar to the OLS estimates. This suggests that our results are not specific to our choice of estimation method.

Results

Meta-Analytic Results

The results of the meta-analyses are presented in Table 1. As we mentioned above, empty cells represent relationships in Figures 1 and 2 that have not been empirically studied. Other cells in Table 1 include the results of only a single study. These cells include the observed correlation as well as the observed correlation corrected for unreliability. Omitting empty cells and cells with a single study, Table 1 includes the results of 146 separate meta-analyses.

We note that some of the cells in Table 1 do not represent relationships that are substantively meaningful in the domain of training or learning research (e.g., the age–organizational commitment correlation). Nonetheless, estimating such relationships was necessary to conduct the meta-analytic path analysis of the two competing theories of training motivation. In general, the number of studies and the sample sizes for the meta-analyses were less for relationships that are exogenous in Figures 1 and 2 (which are usually not substantive relationships) and more for relationships that are endogenous (e.g., relationships with motivation to learn and training outcomes, which are substantive).

The contents of Table 1 are discussed according to the relationships between personality, job/career variables, self-efficacy, valence, age, ability, and situational characteristics with motivation to learn and learning outcomes. These effects can be seen by examining the corrected correlations in Rows 17–23. We used two decision rules in interpreting Table 1. First, correlations with a confidence interval that included zero are not discussed, because such effects fail to achieve statistical significance. Second, we used Cohen's (1988) definition of effect sizes to describe the size of the relationships. According to Cohen (1988), weak, moderate, and strong relationships correspond to correlations of .10, .30, and .50, respectively.

Antecedents of Motivation to Learn and Learning Outcomes

In general, our results suggest that personality variables had a moderate to strong relationship with motivation to learn and learning outcomes. The locus of control–motivation to learn relationship was strong ($r_c = -.46$), with the sign indicating that people with an internal locus of control tended to display higher motivation levels. Locus of control was also moderately related to declarative knowledge ($r_c = .21$) and transfer ($r_c = .27$), with the

opposite effect—people with an external locus of control learned more and had higher transfer levels.

Achievement motivation had a moderate relationship with motivation to learn ($r_c = .35$) and weak to moderate relationships with reactions ($r_c = .20$) and posttraining self-efficacy ($r_c = .22$). The conscientiousness–motivation to learn relationship was moderately positive ($r_c = .38$), but conscientiousness was not significantly related to either declarative knowledge or skill acquisition.

Anxiety had many significant relationships with motivation to learn and training outcomes. It had large negative relationships with motivation to learn ($r_c = -.57$) and posttraining self-efficacy ($r_c = -.57$) and weak to moderate negative relationships with declarative knowledge ($r_c = -.16$), skill acquisition ($r_c = -.15$), and reactions ($r_c = -.23$).

Turning to job/career variables, motivation to learn was strongly to moderately related to job involvement ($r_c = .20$), organizational commitment ($r_c = .47$), career planning ($r_c = .36$), and career exploration ($r_c = .25$). Job involvement was not significantly related to any of the learning outcomes. Organizational commitment, career planning, and career exploration were moderately to strongly related to transfer (r_cs ranged from .22 to .45). Both organizational commitment and career planning were moderately related to posttraining job performance (r_cs = .26 and .23, respectively).

Pretraining self-efficacy had moderate to strong relationships with both motivation to learn and training outcomes. Self-efficacy had strong relationships with motivation to learn ($r_c = .42$), posttraining self-efficacy ($r_c = .59$), and transfer ($r_c = .47$) and moderate relationships with declarative knowledge ($r_c = .30$), skill acquisition ($r_c = .32$), and job performance ($r_c = .22$). It was also weakly related to reactions ($r_c = .17$).

Valence was strongly related to motivation to learn ($r_c = .61$), reactions ($r_c = .53$), and transfer ($r_c = .70$). Valence was also weakly to moderately related to declarative knowledge ($r_c = .20$) and skill acquisition ($r_c = .30$).

Age was weakly but negatively related to motivation to learn ($r_c = -.18$) and declarative knowledge ($r_c = -.19$). The age–posttraining self-efficacy link was moderately negative ($r_c = -.32$).

Consistent with previous meta-analytic findings (Ree & Earles, 1991), the cognitive ability–declarative knowledge ($r_c = .69$), cognitive ability–skill acquisition ($r_c = .38$), and cognitive ability–transfer ($r_c = .43$) relationships were strong. Cognitive ability was also weakly to moderately related to posttraining self-efficacy ($r_c = .22$). We note that in some training contexts, cognitive ability may also be related to pretest levels of declarative knowledge or skill acquisition. In such cases, the independent effect of cognitive ability, when considered together with the pretest, would likely be less than the zero-order effect discussed above.

In terms of situational characteristics, supervisor support, peer support, and positive climate were moderately related to motivation to learn (r_cs of .36, .37, and .39, respectively). These variables were also strongly related to transfer (r_cs of .43, .84, and .37, respectively). Supervisor support was positively related to declarative knowledge ($r_c = .25$), whereas positive climate was positively related to declarative knowledge ($r_c = .14$), skill acquisition ($r_c = .18$), reactions ($r_c = .40$), and job performance ($r_c = .26$).

Table 2

Path Analysis Results for Self-Efficacy, Valence, and Job Involvement

Variable	Self-efficacy (pretraining) ($N = 1,101$)	Valence ($N = 324$)	Job involvement ($N = 149$)
Locus of control	.02	−.21*	−.06
Conscientiousness	.19*	.07	.51*
Anxiety	−.37*	−.20*	(.34*)
Age	−.12*	−.02	(.11)
Climate	.17*	.56*	.36*
Cognitive ability	.39*		
R^2	.35*	.41*	.36*

Note. Data are standardized regression coefficients (βs). Parentheses indicate relationships for which external data were used in calculating correlation.

* $p < .05$.

Relationships Among Outcomes

Motivation to learn was positively related to declarative knowledge ($r_c = .27$) and skill acquisition ($r_c = .16$). It was also strongly related to reactions ($r_c = .45$) and transfer ($r_c = .58$) and also predicted posttraining self-efficacy ($r_c = .18$). It is important to emphasize that the corrected correlations among reactions, declarative knowledge, skill acquisition, and transfer are similar to those found in the meta-analysis conducted by Alliger et al. (1997), with some exceptions. Specifically, we too found little support for Kirkpatrick's (1976) positive linkage between reactions and learning. The corrected correlation between reactions and declarative knowledge was .10, and the corrected correlation between reactions and skill acquisition was .09. Though higher than Alliger et al.'s (1997) values, these represent small effect sizes. This reaffirms the concerns of Alliger et al. (1997) and Alliger and Janak (1989) regarding Kirkpatrick's (1976) proposed linkages.

Our results do differ from Alliger et al.'s (1997) in terms of the learning–transfer relationships. The corrected learning–transfer correlations were moderate to large in our analysis ($r_c = .38$ using declarative knowledge; $r_c = .69$ using skill acquisition) but were small in Alliger et al. (1997). Alliger et al. (1997) did not correct for unreliability, however. The reliability of learning measures (often lower than those of other outcome measures) may account for some of the differences in effect size magnitude.

Meta-Analytic Path Analysis Results

Path analysis results are shown in Tables 2–6. The tables present the standardized path coefficients (βs) and also provide estimates of variance explained. The harmonic mean sample size is shown beneath each dependent variable. Path coefficients surrounded by parentheses indicate relationships whose Table 1 cells were empty, meaning that external data had to be used. Those three path coefficients should not be interpreted. In addition, the path analysis results for the completely mediated model are shown in Figure 3, and the path analysis results for the partially mediated model are shown in Figure 4. Because of the sheer number of paths, some coefficients in Figure 4 may be more easily read in Tables 2–6.

Table 2 shows that, with few exceptions, personality variables, age, climate, and cognitive ability had independent relationships with pretraining self-efficacy, valence, and job involvement. Ex-

ceptions were the conscientiousness–valence and age–valence relationships, which were no longer significant when the effects of the other variables were considered. As a set, the exogenous variables in Figures 1 and 2 explained 35% of the variance in pretraining self-efficacy, 41% of the variance in valence, and 36% of the variance in job involvement.

Table 3 shows the path analysis results with motivation to learn as the dependent variable. Here we can begin to evaluate the relative merits of the completely mediated model (Figures 1 and 3) and the partially mediated model (Figures 2 and 4). The first step of the analysis regressed motivation to learn on its three most proximal antecedents—self-efficacy, valence, and job involvement. The set explained 46% of the variance in motivation to learn, though the unique effect of job involvement was not significant. The completely mediated model suggests that the more distal variables—personality, age, and climate—do not explain incremental variance. This was not the case, as the second step explains an additional 27% of the variance in motivation to learn, with only conscientiousness lacking an independent effect. In total, the partially mediated model explained 73% of the variance in motivation to learn.

Table 4 shows the path analysis results with the learning outcomes as the dependent variables. Motivation to learn was a

Table 3

Path Analysis Results for Motivation to Learn

Step and variable	Motivation to learn ($N = 550$)
Step 1	
Self-efficacy (pretraining)	.29*
Valence	.54*
Job involvement	.06
R^2	.46*
Step 2	
Locus of control	−.42*
Conscientiousness	−.01
Anxiety	−.35*
Age	−.13*
Climate	.24*
ΔR^2	.27*
R^2	.73*

Note. Data are standardized regression coefficients (βs).

* $p < .05$.

Table 4

Path Analysis Results for Learning Outcomes

Step and variable	Declarative knowledge (N = 1,059)	Skill acquisition (N = 734)	Self-efficacy (posttraining) (N = 200)	Reactions (N = 295)
Step 1				
Motivation to learn	.39*	.22*	.22*	.45*
Cognitive ability	.76*	.42*	.25*	−.03
R^2	.63*	.20*	.09*	.20*
Step 2				
Locus of control	.51*	.04	−.49*	.52*
Conscientiousness	−.12*	−.18*	.14*	−.17*
Anxiety	−.25*	−.35*	−.75*	.09
Age	.08*	.09*	−.35*	.23*
Climate	−.29*	.07	.91*	−.02
ΔR^2	.24*	.09*	.77*	.27*
R^2	.87*	.29*	.86*	.47*

Note. Data are standardized regression coefficients (βs).
* $p < .05$.

significant predictor of all four outcomes, whereas cognitive ability predicted declarative knowledge, skill acquisition, and posttraining self-efficacy. This first step of the analyses illustrates that motivation to learn explained variance in learning over and above cognitive ability—there was "much more than g." As a set, motivation to learn and ability explained 63% of the variance in declarative knowledge, 20% of the variance in skill acquisition, 9% of the variance in posttraining self-efficacy, and 20% of the variance in reactions. Again, the completely mediated model suggests that the effects of more distal variables on learning are completely mediated by motivation to learn. This was again not the case, as the distal variables explained incremental variance in all four outcomes, particularly posttraining self-efficacy and reactions. In some cases, a variable had a nonsignificant zero-order effect but a significant effect once motivation and ability were controlled. Examples were the negative correlation between locus

of control and self-efficacy (individuals with an internal locus of control had higher efficacy) and the negative correlation between conscientiousness and declarative knowledge. In other cases, the sign of a variable's relationship was reversed once motivation and ability were controlled for; examples are the relationships between age, positive climate, and declarative knowledge. This may have been the result of a suppression effect (Cohen & Cohen, 1983). In total, the partially mediated model explained 87% of the variance in declarative knowledge, 29% of the variance in skill acquisition, 86% of the variance in posttraining self-efficacy, and 47% of the variance in reactions.

Table 5 shows the path analysis results with transfer as the dependent variable. Step 1 illustrated that skill acquisition and posttraining self-efficacy (but not declarative knowledge) were the primary antecedents of transfer. As a set, the four learning outcomes explained 53% of the variance in transfer. The partially mediated model again received support, as the distal variables explained an incremental 28% of the variance in transfer. In total, the model explained 81% of the variance in transfer.

Table 6 shows the path analysis results with posttraining job performance as the dependent variable. Whereas transfer explained

Table 5

Path Analysis Results for Transfer

Step and variable	Transfer (N = 173)
Step 1	
Declarative knowledge	−.03
Skill acquisition	.59*
Self-efficacy (posttraining)	.27*
Reactions	.03
R^2	.53*
Step 2	
Locus of control	.41*
Conscientiousness	.52*
Anxiety	(.21*)
Age	.09*
Climate	.12*
ΔR^2	.28*
R^2	.81*

Note. Data are standardized regression coefficients (βs). Parentheses indicate relationships for which external data were used in calculating correlation.
* $p < .05$.

Table 6

Path Analysis Results for Job Performance

Step and variable	Job performance (N = 100)
Step 1	
Transfer	.59*
R^2	.35*
Step 2	
Locus of control	.29*
Conscientiousness	.31*
Anxiety	.26*
Age	−.05
Climate	.08
ΔR^2	.12*
R^2	.47*

Note. Data are standardized regression coefficients (βs).
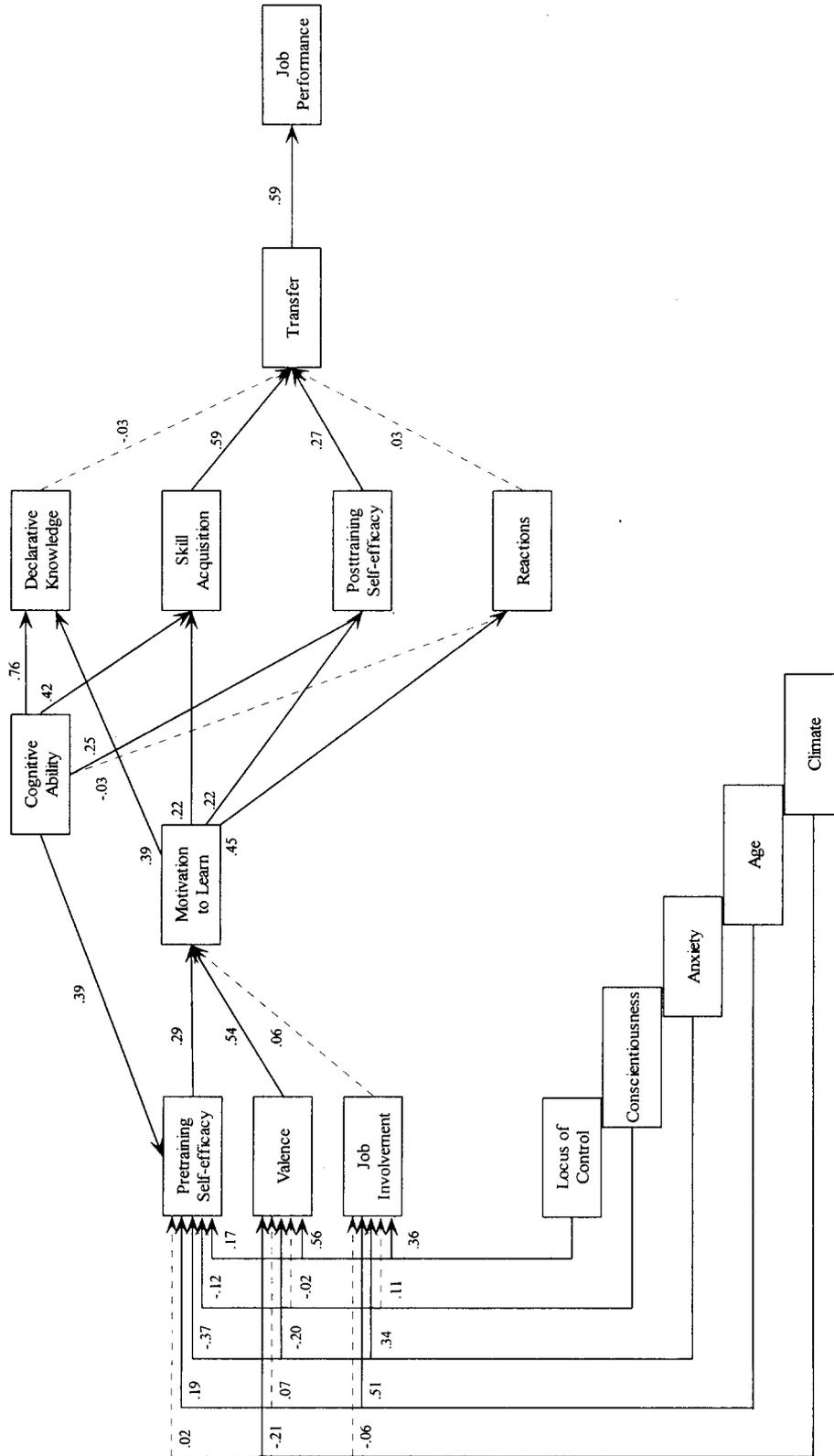* $p < .05$.

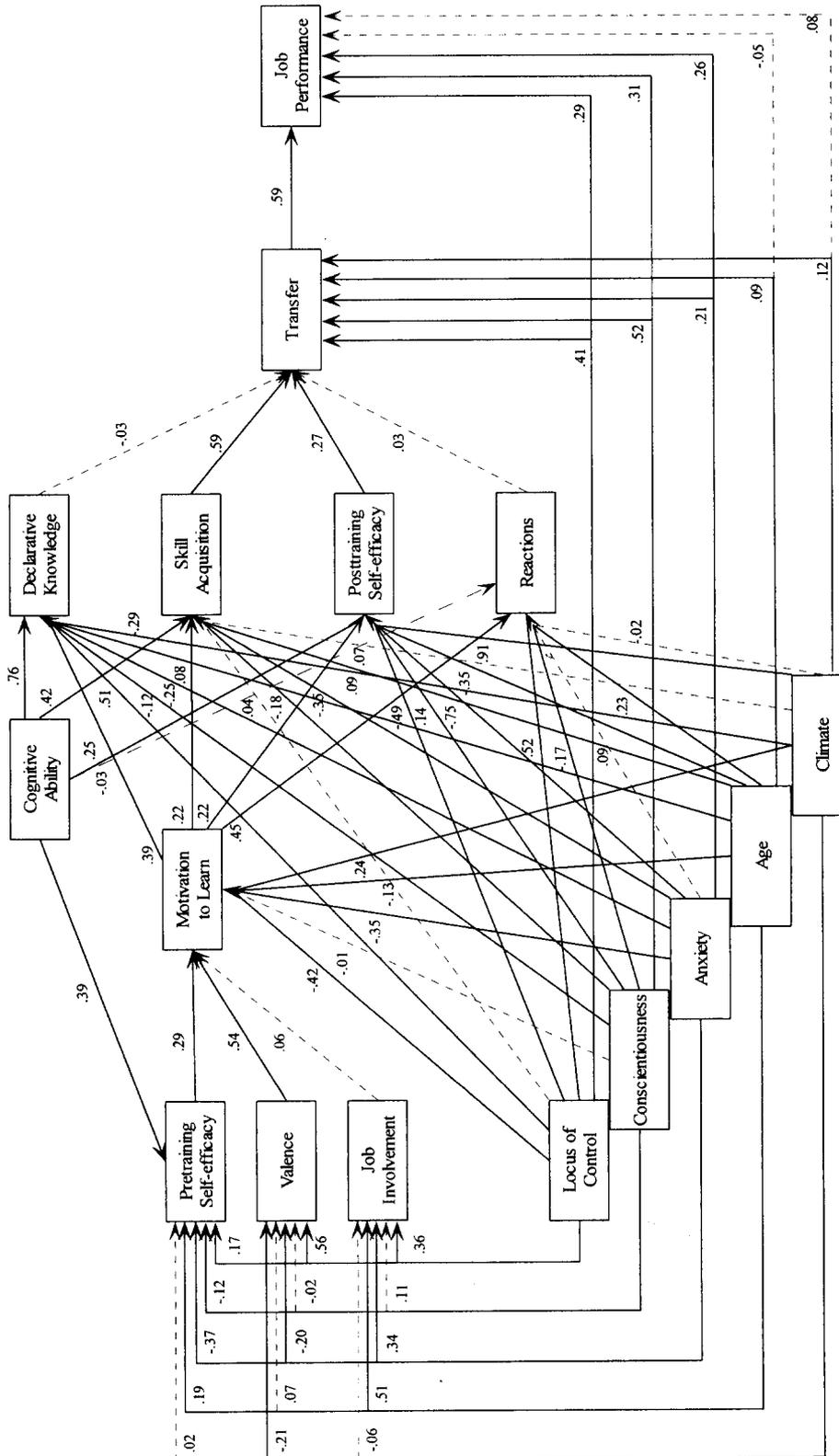*Figure 3.* Path coefficients for a completely mediated version of an integrative theory of training motivation.

Figure 4. Path coefficients for a partially mediated version of an integrative theory of training motivation.

35% of the variance in job performance, the distal variables explained an incremental 12%, again supporting the partially mediated model. The incremental variance explained was due entirely to the personality variables. In total, the model explained 47% of the variance in job performance.

As a further test of the relative merits of the completely mediated and partially mediated models, we calculated an index of global model fit using Hunter and Hamilton's (1992) Path software program. Specifically, we analyzed the sum of the squared residuals derived from comparing the actual correlation matrix with the matrix reproduced using the structural equations embedded within Figures 3 and 4. We used the harmonic mean of the entire correlation matrix ($N = 285$) to test the significance of the sum of the squared residuals, which is distributed as a chi-square. For the completely mediated model, $\chi^2(73, N = 285) = 474.45, p < .001$. For the partially mediated model, $\chi^2(39, N = 285) = 181.82, p < .001$. Given that one model is nested within another, it was possible to conduct a chi-square difference test. The difference in chi-square was $474.45 - 181.82 = 292.63$, which is itself distributed as a chi-square with $73 - 39 = 34$ degrees of freedom. This value was statistically significant ($p < .001$), suggesting that the partially mediated model fit the data better than did the completely mediated model. Further support for the partially mediated model came from examining the average size of the residuals. The average of the absolute values of the residuals for the partially mediated model was .05, as compared with .11 for the completely mediated model.

Still further support for the partially mediated model is given by an examination of the missing link analysis provided by Hunter and Hamilton's (1992) Path software. This analysis suggested modifications to the a priori model in the form of additional paths that would improve model fit. Many of the suggested modifications concerned cases in which the relationships between job/career variables, self-efficacy, valence, and learning outcomes were not completely mediated by motivation to learn (just as the relationships with personality, age, and climate were not completely mediated). Specifically, the results suggested the addition of the following paths: job involvement → declarative knowledge, job involvement → transfer, pretraining self-efficacy → declarative knowledge, pretraining self-efficacy → transfer, valence → skill acquisition, valence → reaction, and valence → transfer. This suggests that not only were the effects of individual and situational characteristics not completely mediated but neither were the effects of more proximal variables.

Discussion

As we noted at the outset, an increasing number of models and predictors of training motivation have been proposed in recent years. Because of inconsistent approaches and results, this research has not resulted in a coherent literature on training motivation and effectiveness. This article seeks to better understand training motivation by briefly reviewing the literature, integrating existing work into two competing integrative theories of training motivation, testing the relationships in the theories using meta-analysis, and using meta-analytic path analysis to compare the merits of the two theories' structures.

Discussion of Meta-Analysis Results

The results of the meta-analyses showed that many of the variables studied in the extant literature did indeed correlate with variables important in a training context, including motivation to learn, declarative knowledge, skill acquisition, posttraining self-efficacy, reactions, transfer, and posttraining job performance. In terms of personality variables, locus of control was related to motivation to learn (with internals being more motivated) as well as to declarative knowledge and transfer (with externals showing higher levels). Strong relationships were also shown with anxiety, which was negatively related to every training outcome examined. Although achievement motivation also yielded many positive relationships, the results for conscientiousness may seem disappointing when compared with Barrick and Mount's (1991) meta-analysis. Specifically, conscientiousness was positively related to motivation to learn but was actually negatively related to skill acquisition. Martocchio and Judge (1997) suggested that this counterintuitive result could be explained by conscientious individuals' tendency to be self-deceptive regarding actual learning progress. Alternatively, such individuals might engage in more self-regulatory activity, which detracts from their on-task attention (e.g., Kanfer & Ackerman, 1989).

Nonetheless, when taken as a whole, these results have broad implications for the needs assessment phase of the training process (Goldstein, 1991). In particular, the effects reviewed above suggest that the evaluation of trainee personality should become a vital part of the person-analysis phase of the needs assessment (Goldstein, 1991). Unfortunately, the fact that so few personality variables have been examined with great frequency suggests that much more research needs to be done in this area. Future research might expand the breadth of personality variables, possibly by examining trait goal orientation, other Big Five variables, or affectivity.

As for job/career variables, job involvement, organizational commitment, career planning, and career exploration were positively related to a variety of outcomes, including training motivation, reaction, posttraining self-efficacy, transfer, and job performance. However, the number of studies including job/career variables was limited, suggesting that future research would benefit from including them more frequently. Indeed, many job/career variables could not even be included in the meta-analyses (e.g., career identity, career salience), whereas others could not be included in the path analysis (e.g., career commitment, organizational commitment). Only job involvement has received consistent research attention (e.g., Mathieu et al., 1992; Noe & Schmitt, 1986). At a general level, such gaps can be explained by the preponderance of laboratory studies and military field studies, which are less likely to assess job/career variables.

In contrast to job/career variables, self-efficacy and valence have been assessed quite frequently. These variables were positively related to motivation to learn as well as to all the training outcomes we examined. This evidence continues to underscore the importance of self-efficacy and valence in models of motivation and performance (e.g., Bandura, 1997; Kanfer, 1991; Van Eerde & Thierry, 1996). Thus, trainers would do well to leverage both these constructs at the beginning of training. This could be done by more extensively demonstrating the behaviors that are the target of training or by persuading trainees that they are capable of succeeding. Gist and Mitchell's (1992) model of self-efficacy and

performance illustrates that vicarious experiences and verbal persuasion are both means of promoting self-efficacy. Trainers could further emphasize all the benefits of training to promote valence levels, from increased work performance to better career mobility to potential increases in salary or promotions.

Other individual characteristics linked to motivation and learning included cognitive ability and age. Cognitive ability was again shown to be a robust predictor of training outcomes (e.g., Ree & Earles, 1991). Our results further suggested that cognitive ability had a stronger relationship with traditional learning outcomes (e.g., declarative knowledge or skill acquisition) than it did with reactions or posttraining self-efficacy. Age was also linked to motivation to learn and learning, as older trainees demonstrated lower motivation, learning, and posttraining self-efficacy. This suggests that trainers may have to take precautions to ensure that older trainees can succeed during the training program. This is especially critical as training content or methods use new technologies, such as web-based instruction or virtual reality, with which older workers may be less comfortable. These results pose a challenge to future training practitioners, given that two trends in today's organizations are the increasing age of the workforce and the increasing introduction of new technologies (Howard, 1995).

Situational characteristics were also shown to be important, both in terms of the climate in which the trainee functions and the support the trainee receives from his or her supervisor and peers. Indeed, these variables were related to motivation to learn, declarative knowledge, skill acquisition, reactions, transfer, and job performance, though some of those results were based on few studies. Although recent research has examined climate and support (e.g., Birdi et al., 1997; Ford et al., 1992; Noe & Wilk, 1993; Rouiller & Goldstein, 1993; Tracey et al., 1995), examination of situational characteristics remains surprisingly rare. As with job/career variables, this is likely a function of the preponderance of laboratory and military studies in the literature. Still, the results shown here suggest that the measurement of situational characteristics is a critical aspect of the organizational analysis phase of the training needs assessment (Goldstein, 1991). Future research is therefore needed to identify the specific facets of climate, culture, and context that have the most positive relationships with training motivation and outcomes.

Discussion of Meta-Analytic Path Analysis Results

Meta-analytic path analysis allowed us to go one step beyond the individual meta-analyses by assessing the adequacy of the theoretical structures shown in Figures 1 and 2. This analysis allowed us to first show that motivation to learn did indeed explain incremental variance in learning outcomes over and above cognitive ability. Thus, when it came to predicting learning outcomes, there was "much more than g." This argues against a "g-centric" approach to trainability and suggests that individual differences besides cognitive ability are a critical concern in the needs assessment.

The path analysis also allowed us to test the relative merits of the completely mediated model (Figure 1) and the partially mediated model (Figure 2). The former was based on need–motive–value and cognitive choice theories of motivation (Kanfer, 1991), whereas the latter was based on integrative theories of motivation proposed by Naylor et al. (1980), Kanfer and Ackerman (1989),

and Katzell and Thompson (1990). Our results provide compelling support for the partially mediated model. Personality, age, and climate—the most distal variables in the model—explained incremental variance in motivation to learn, declarative knowledge, skill acquisition, posttraining self-efficacy, reactions, transfer, and posttraining job performance. In most cases, at least a third of the total variance explained was due to the contribution of the distal variables over and above the more proximal variables. The partially mediated model also demonstrated better fit in terms of the sum of the squared residuals and had lower average residuals than the completely mediated model.

These results suggest that individual and situational characteristics may be critical factors before training (by relating to training motivation), during training (by relating to learning levels), and after training (by relating to transfer and job performance). Thus, Figures 2 and 4 stand as the better "first step" toward an integrative theory of training motivation. This has implications for training practice by suggesting that the more comprehensive the needs assessment, the better. Many training practitioners might assume that there are diminishing returns as the person and organization analyses are expanded. For example, if locus of control is assessed, is it really necessary to consider anxiety and age as well? If the climate for transfer seems positive, is it still important to consider individual characteristics? If useful outcomes can be derived from training and trainees seem confident in their ability to learn the material, is it even necessary to conduct further examinations of the person and organization context?

Our results suggest that the answer to these questions is yes. Personality, job involvement, self-efficacy, valence, and climate were not redundant with one another. Instead, they contributed "value added" in terms of understanding when training should succeed. Moreover, we may have underestimated their value added, because our analyses did not test for the types of Person × Situation interaction effects that are often found in organizational behavior (Roberts, Hulin, & Rousseau, 1978). As we noted earlier, a positive climate exists to the extent that adequate resources are present, cues and opportunities for using trained skills exist, feedback is given, and favorable consequences for using training content are emphasized. Although our results showed that such a climate has positive direct effects even when considered in conjunction with individual characteristics, it is also likely that such climates interact with individual characteristics. Perhaps positive climates could magnify individual difference effects in the same manner as high levels of autonomy and discretion (e.g., Barrick & Mount, 1993; Weiss & Adler, 1984).

Implications for Future Training Research

Our results have several implications for future research in the areas of training motivation and effectiveness. One striking result of the path analysis is that the constructs shown in Figure 2 were much better at explaining declarative knowledge ($R^2 = .87$) than skill acquisition ($R^2 = .29$). This result is problematic, because the path analysis also showed that declarative knowledge did not relate to transfer when considered simultaneously with skill acquisition. Thus, the preliminary version of the integrative theory shown in Figures 2 and 4 could best be improved by adding variables more predictive of skill acquisition. We note, however, that the theory

was very much able to explain variance in posttraining self-efficacy ($R^2 = .87$), which did have an independent relationship with transfer.

The posttraining self-efficacy–transfer linkage underscores the importance of Kraiger et al.'s (1993) motivational class of learning outcomes. Although declarative knowledge and skill acquisition continue to compose the sole criteria in many training studies, Martocchio and Baldwin (1997) emphasized that many organizations are beginning to broaden their view of training outcomes. This broadening may include nonbehavioral or cognitive factors that distinguish effective from ineffective performance or help employees adapt to performance requirements (Kraiger, 1999). Nonbehavioral factors may include team commitment and coordination, acceptance of technology, customer focus, and willingness to work in a self-directed fashion. Cognitive examples may include technical vitality (anticipating learning to meet changing job demands) and contextual knowledge (recognizing contextual influences on performance). We echo the sentiments of Alliger et al. (1997) in the discussion of their meta-analysis. Future research must expand the newer types of training outcomes, and one day meta-analyses such as this should be repeated to examine those alternative outcomes.

From a theory-building perspective, one of the questions raised by our results is "If the effects of individual and situational characteristics are not fully mediated by self-efficacy, valence, job/career variables, and motivation to learn, what are the other intervening mechanisms?" No doubt the theory shown in Figure 2 would benefit from the examination of additional mechanisms to explain relationships with the distal variables. One good example may be Martocchio and Judge's (1997) work on the relationship between conscientiousness and learning. As we mentioned above, they showed that one explanation for the negative relationship between conscientiousness and learning was conscientious learners' tendency to be self-deceptive regarding learning progress.

Another mechanism that may help build on our integrative theory is state goal orientation (e.g., Button, Mathieu, & Zajac, 1996; Dweck, 1989). Kraiger et al. (1993) suggested that one critical process variable during training is whether learners adopt a mastery or performance orientation as they learn, which can be influenced by both individual and situational characteristics. In addition, London and Mone (1999) suggested that the way in which employees develop an understanding of their performance and learning needs, how they take action to seek feedback, how they respond to barriers, and how they learn from experience could be potentially critical influences on training motivation and learning. This suggests that career insight, feedback behaviors, and adaptability behaviors may also be important mechanisms to investigate in future research. Indeed, LePine, Colquitt, and Erez (in press) recently showed that high openness to experience and low conscientiousness were associated with more adaptability in the face of task difficulties. Such adaptability is likely to be critical in difficult training programs that utilize new or unfamiliar technologies.

Finally, as research on training motivation becomes more refined, it will be necessary to integrate this work with earlier research on training settings and methods (Tannenbaum & Yukl, 1992). There have been examples of such integration, as in the literature on Aptitude × Treatment interactions (e.g., Cronbach & Snow, 1977). This research could be extended to focus on the

types of Person × Context interactions proposed in the leadership literature (Howell, Dorfman, & Kerr, 1986). For example, the context of web-based training—which affords higher levels of learner control during instruction—could interact with anxiety or age to influence outcomes. Perhaps such contexts could be designed to neutralize the negative effects of anxiety or age or enhance the positive effects of motivation to learn. Similarly, there may be training sequencing or media choices that can neutralize the effects of low self-efficacy while having a positive direct effect on learning, in effect "substituting for self-efficacy." In fact, it may be that training design variables are precisely the moderator variables suggested by the asterisks in Table 1. Examining such issues requires a broader view of training research.

Study Limitations

This study has some limitations that should be noted. First, the results shown in Table 1 were based on studies that had directly examined training or learning or used a sample of individuals who took part in those activities. However, some of the cell results were based on small sample sizes or few studies and were therefore subject to second-order sampling error (Hunter & Schmidt, 1990). However, we note that relationships with training outcomes, the most substantive relationships in Table 1, tended to be estimated with higher sample sizes.

In addition, the meta-analytic path analysis was limited by the need to choose a sample size that may not have been representative of all cells included in the analysis. We sought to lessen this limitation by using path analysis rather than global model estimation and by using the harmonic mean rather than the arithmetic mean. Still, although most of the cells in a given analysis contained more observations than the sample size employed, some did contain less. Thus, in a few cases the sample size used in the analyses underestimated the influences of sampling error.

Furthermore, many of the linkages in Figures 3 and 4 are based on meta-analytic correlations for which moderators were present. This suggests that the fit of certain parts of our theory may vary as a function of other variables. This issue is not as critical when moderators alter only the strength, as opposed to the direction, of the effects but may have a large impact when moderators produce crossed interactions. In fact, it is interesting to note that the most surprising results in this review were the lack of positive effects for conscientiousness, and correlations with conscientiousness seemed especially dependent on moderators (as evidenced by the standard deviations of the corrected correlations and the variance explained by artifacts). Martocchio and Judge (1997) and LePine et al. (in press) showed that conscientiousness can have negative effects when self-deceptive tendencies can harm learning or when adaptability is needed to achieve success. It may be that facets of the learning context create a crossed moderator effect, partially accounting for the surprising conscientiousness results.

Moreover, some of the correlations with situational characteristics included individual perceptions of the situation (e.g., Mathieu et al., 1992), whereas others included perceptions aggregated to a higher level of analysis (e.g., Tracey et al., 1995). These two types of correlations therefore have different statistical properties, as aggregation can alter covariation with other variables (Robinson, 1950). Ostroff and Harrison (1999) recently examined this issue and noted that differences in correlations across levels of

analysis are more likely to occur when there is a strong normative component operating at the higher level. As research on situational characteristics becomes more widespread (and more studies are available for inclusion in reviews of this type), researchers could code the level of analysis to explicitly examine it as a moderating variable. This approach was used by Gully, Devine, and Whitney (1995) in a meta-analysis of cohesion and performance.

Finally, the meta-analytic path analysis had to exclude several variables because of missing cells. Although we feel that we omitted variables that were to some extent redundant with variables retained in the model (e.g., omitting career commitment while retaining job involvement) and we made sure to retain all types of variables shown in Figures 1 and 2, we cannot rule out the possibility of an unmeasured variable problem (James, 1980). For this reason and the limitations noted above, this article represents only a first step toward an integrative theory of training motivation.

Conclusion

As we noted at the outset, training researchers have traditionally focused on training methods and training settings as a means of promoting learning. However, it soon became clear that even when methods were held constant, some trainees learned more than others (Campbell, 1988; Tannenbaum & Yukl, 1992). The literature on training motivation arose in part to explain such differences. This review summarizes this burgeoning literature and illustrates the set of individual and situational characteristics that can be leveraged to improve training motivation and learning. Our results suggest several implications for training research and practice:

1. The person-analysis and organizational-analysis phases of the needs assessment offer critical information, given the effects of personality and climate on training motivation and learning.

2. Trainers would benefit from using techniques that increase trainee efficacy and emphasize job and career benefits of training, given the effects of self-efficacy, valence, and job involvement.

3. A "g-centric" approach to trainability is insufficient, given the strong effects of motivational variables over and above cognitive ability.

4. Training scholars should focus their efforts on better explaining skill acquisition, given the lower variance-explained values for that variable versus declarative knowledge.

5. Training research should continue to examine motivational outcomes of training, given that posttraining self-efficacy related to transfer independent of skill acquisition.

6. Further theory development is needed to uncover other intervening mechanisms that link individual and situational characteristics with training motivation and learning.

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