Training Transfer: An Integrative Literature Review

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Given the proliferation of training transfer studies in various disciplines, we provide an integrative and analytical review of factors impacting transfer of training. Relevant empirical research for transfer across the management, human resource development (HRD), training, adult learning, performance improvement, and psychology literatures is integrated into the review. We synthesize the developing knowledge regarding the primary factors influencing transfer—learner characteristics, intervention design and delivery, and work environment influences—to identify variables with substantive support and to discern the most pressing gaps. Ultimately, a critique of the state of the transfer literature is provided and targeted suggestions are outlined to guide future empirical and theoretical work in a meaningful direction.

Keywords: *training transfer; learner characteristics; intervention design; work environment; integrative literature review*

Since Baldwin and Ford's (1988) highly recognized review of the "transfer problem" in training research, an outpouring of conceptual and research-based suggestions have focused on how to lessen the gap between learning and sustained workplace performance. Estimates of the exact extent of the transfer problem vary, from Georgenson's (1982) estimate that 10% of training results in a behavioral change to Saks' (2002) survey data, which suggest about 40% of trainees fail to transfer immediately after training, 70% falter in transfer 1 year after the program, and ultimately only 50% of training investments result in organizational or individual improvements. Given these estimates, it is clear that learning investments continue to yield deficient results, making training transfer a core issue for human resource development (HRD) researchers and practitioners focused on designing interventions that support individual, team, and organizational performance (Yamnill & McLean, 2001).

As the stream of transfer research continues to infiltrate various academic disciplines (management, HRD, training, adult learning, psychology), the need for a comprehensive and analytical review is warranted to summarily link the assorted genres of transfer research and provide targeted direction moving forward. The last comprehensive literature review was offered by Ford and Weissbein (1997) and addressed the suggestions put forth in the seminal work of Baldwin and Ford (1988). These works identified gaps in the way transfer was viewed, studied, and measured, and have provided numerous opportunities to improve the study of transfer, especially in applied settings. While not attempting to keep in step with decade reviews, we do feel that advancements in the last decade in each of the areas—learner, design, and work environment—require an updated synthesis of the transfer literature to provide both experienced and emerging transfer scholars direction for future research.

To conduct this integrative review, we first identified a taxonomy of major conceptual factors influencing transfer in order to categorize the diverse variables permeating the literature. Specifically, we examine the developing knowledge of three primary factors influencing transfer—learning characteristics, intervention design and delivery, and work environment influences—as based upon influential conceptual models in the field (Alvarez, Salas, & Garofano, 2004; Baldwin & Ford, 1988; Ford & Weissbein, 1997; Salas, Cannon-Bowers, Rhodenizer, & Bowers, 1999). We based our review on these frameworks because existing transfer research continues to fall within the three broad categories of the individual, intervention, and environment factors.[1] More recent transfer reviews (such as Bates, 2002; Cheng & Ho, 2001; Russ-Eft, 2002), while useful, have drawn conclusions from conceptual and only select empirical work (or did not use criteria to identify articles), thus limiting what we know about the science of transfer study. As such, this article provides a comprehensive synthesis of the more rigorous transfer research available and presents guidance for future research aimed at developing theories and knowledge regarding transfer.

Using Torraco's (2005) guide for conducting integrative literature reviews, we examine and evaluate the literature with the goal of answering the following research questions:

- What variables in the mature and diverse transfer literature have exhibited strong empirical support for influencing transfer outcomes?
- Where are gaps most pressing across each factor affecting transfer?
- What methodological progress been made (since Baldwin & Ford, 1988) and what variables remain understudied (since Ford & Weissbein, 1997)?
- How should future theoretical and empirical transfer research proceed given our findings?

Ultimately, a critique of the state of the transfer literature is provided and targeted suggestions are outlined to guide future empirical and theoretical work in a meaningful direction.

A Review of the Literature

Domain and Selection Criteria

Training transfer generally refers to the use of trained knowledge and skill back on the job. For transfer to occur "learned behavior must be generalized to the job context and maintained over a period of time on the job" (Baldwin & Ford, 1988, p. 63). We focus our review on empirical findings grounded in theory and assessed using a sufficiently rigorous methodological approach (as determined by the academic peer review process) or qualitative work guided by a theoretical lens. Variables in the paper are substantiated by findings from a meta-analysis and/or by at least two empirical studies in peer-reviewed journals.[2] We emphasize meta-analyses and empirical investigations particularly those relevant peer-reviewed pieces published in the last several decades. Conference presentations were not included and conference proceedings were limitedly utilized to stay true to our selection criteria of using peer-reviewed studies. Research conducted in applied and field settings was our primary interest; yet, we incorporate case-based or lab data where quantitative field data are scant. Our study was not limited to a specific time range, and publications in diverse although relevant disciplines were sought including: management, HRD, training, adult learning, performance improvement, and psychology.

We systematically searched online databases such as Business Source Premier & Complete, Academic Source Premier, PsycINFO, Professional Development Collection, and ERIC. Using relevant keywords, we searched for: *transfer of training, transfer of learning, training transfer, skill maintenance*, and *skill generalization* to identify published empirical articles exploring transfer. To be included, the article needed to provide a description of the transfer construct either explicitly (e.g., in an operational definition) or with enough information provided throughout the abstract, introduction, method, results, and/or discussion sections to clearly indicate that transfer (i.e., the application of trained knowledge and skills on the job) was the criterion variable of interest. In all, we identified approximately 170 articles that were relevant for our study, although some articles provided relevant results for multiple factors affecting transfer. As introduced earlier, articles were ultimately categorized for discussion using the taxonomy of three long-standing factors affecting transfer (learner characteristics, intervention design, and work environment). Each is discussed, summarized, and critiqued.

Learner Characteristics

A learner's characteristics influence training outcomes; that is, one of the more enduring conceptualizations in the psychology literature is that an individual's ability and motivation affect performance (Sackett, Gruys, & Ellingson, 1998). Thus, the primary learner characteristics influencing training

transfer examined here include the trainee's intellectual ability, self-efficacy regarding the training task, motivation level, as well as job/career variables and personality traits that largely affect trainee motivation.

Cognitive Ability

Support has long existed for the influence of general mental ability in the training and learning venue (Baldwin & Ford, 1988). Clark and Voogel (1985) argue that "one of the most common and supportable findings in educational research is that far transfer is achieved by students with higher general ability scores" (p. 120). Ree and Earles (1991) examined which measure of intelligence best predicted training success and found that general intelligence was best. Kanfer and Ackerman (1989) found cognitive ability clearly exerted an effect on trainee performance due to its effect on attentional resource capacity, and Robertson and Downs (1979) found trainee ability accounted for 16% of the variance in training effectiveness. Ultimately, Colquitt, LePine, and Noe (2000) echoed earlier findings by performing an extensive meta-analysis ($n = 310$) based on 20 years of training research and found the corrected correlation coefficient between cognitive ability and training transfer is moderately high at .43. More recently, general cognitive ability (as mediated by knowledge structures) improved retention of a complex skill in a lab test of a 3-day video game training program (Day, Arthur, & Gettman, 2001).

Self-Efficacy

Judgments trainees make about their competency to perform tasks (Gist, Schwoerer, & Rosen, 1989), or self-efficacy, have also received strong support for influencing transfer in the extant literature. Bandura (1982) defined self-efficacy as judgments individuals make about their competency to perform a defined task; he identified four sources of self-efficacy development—enactive mastery, modeling, verbal persuasion, and arousal. Various studies have found a positive relationship between pretraining self-efficacy and ultimate training mastery (Harrison, Rainer, Hochwarter, & Thompson, 1997; Holladay & Quinones, 2003; Mathieu, Martineau, & Tannenbaum, 1993). In terms of transfer outcomes, self-efficacy has been found to be positively related to transfer generalization and transfer maintenance across multiple studies (Chiaburu & Marinova, 2005; Ford, Smith, Weissbein, Gully, & Salas, 1998; Gaudine & Saks, 2004; Gist, 1989; Latham & Frayne, 1989; Mathieu, Tannenbaum, & Salas, 1992; Saks, 1995; Stevens & Gist, 1997; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991).

Some interventions that have been designed to increase learner self-efficacy have produced increases in training performance (Gist, 1989; Gist, Stevens, & Bavetta, 1991; Morin & Latham, 2000; Stevens & Gist, 1997) indicating self-efficacy is a malleable learner characteristic (in contrast to trainees' innate

intelligence). For example, support for including self-efficacy development methods to enhance transfer have been demonstrated: (a) when mastery experiences and supportive feedback were included as a transfer intervention (Gist, 1986), (b) when goal setting and self-management strategies were used in a posttraining transfer intervention (Gist et al., 1991), and (c) when participants used verbal self-guidance as part of a transfer intervention (Brown & Morrissey, 2004).

Motivation

Training motivation refers to the intensity and persistence of efforts that trainees apply in learning-oriented improvement activities, before, during, and after training (Tannenbaum & Yukl, 1992). Various motivation-relevant constructs have been examined in training research, including pretraining motivation and motivation to learn. Specifically, a few studies support the influence of *pretraining motivation*—or the learner's level of intensity and desire as measured before the training intervention—on actual transfer outcomes (Chiaburu & Marinova, 2005). For example, in their 967 person sample, Facteau, Dobbins, Russell, Ladd, and Kudisch (1995) found the correlation between pretraining motivation and training transfer as measured by supervisors was a healthy .45. Quinones (1995) also found that *motivation to learn* was a key variable linking pretraining characteristics and training outcomes, and motivation to learn was reported in Noe (1986) as having a potentially substantial impact on training effectiveness, mostly based on prior studies in military settings.

Motivation to transfer is the learner's intended efforts to utilize skills and knowledge learned in training setting to a real world work situation (Noe, 1986). In their empirical study, Axtell, Maitlis, and Yearta (1997) found motivation to transfer was a significant predictor of positive transfer at one year. However, the majority of studies has continued to examine motivation to transfer as an outcome variable influenced by participant motivation to learn (Kontoghiorghes, 2002), self-efficacy (Machin & Fogarty, 2004), utility reactions (Ruona, Leimbach, Holton, & Bates, 2002), or transfer climate factors (Seyler, Holton, Bates, Burnett, & Carvalho, 1998). Thus, future research should confirm direct linkages between the latter two motivation variables and transfer outcomes.

The *extrinsic and intrinsic* components of motivation have also been linked to training outcomes. Although research has found influences for both extrinsic and intrinsic factors on transfer (Rouiller & Goldstein, 1993; Santos & Stuart, 2003; Taylor, Russ-Eft, & Chan, 2005; Tracey, Tannenbaum, & Kavanagh, 1995), preliminary findings appear to favor intrinsic factors. For example, in Facteau et al. (1995) trainees who perceived intrinsic reasons to attend training reported higher levels of motivation to attend and learn (i.e., precursors of transfer), whereas extrinsic rewards and benefits were not significantly related to

pretraining motivation. Similarly, Kontoghiorghes (2001) found that intrinsic variables such as a sense of recognition were found to be more influential on the retention of training ($r = .34$) compared to extrinsic factors such as pay ($r = -.07$) and promotions ($r = .05$). However, we should note that in a meta-analysis of behavioral modeling training methods by Taylor et al. (2005), transfer outcomes were greatest when extrinsic components (such as transfer being notated in performance appraisals) were instituted in the trainees' work environments. Thus, disentangling the influence of intrinsic versus extrinsic motivational components on transfer outcomes would benefit from further study.

Personality

Influencing trainee performance are innate dispositional variables that can affect the direction, level, and persistence components of trainee motivation (Herold, Davis, Fedor, & Parsons, 2002; Kanfer & Ackerman, 1989). In the Colquitt et al. (2000) meta-analysis, *anxiety* produced negative correlations with every training outcome examined in their study, including transfer. Machin and Fogarty (2004) found *negative affectivity* (i.e., the dispositional tendency of individuals to feel negative emotions) as the only significant predictor of posttraining transfer implementation intentions, and Webster and Martocchio (1993) linked anxiety to reduced training motivation (which in turn can affect transfer). As might be predicted, Naquin and Holton (2002) found trainees with high positive affectivity to have higher motivations to improve their work performance through learning. Equipped with a sense of steadiness, trainees high in positive affect may be able to readily focus on training tasks, absent mental distractions.

The findings related to *openness to experience* are limited although those open to experience across multiple job categories in Barrick and Mount's 1991 meta-analytic study exhibited higher training proficiency (Rho = .25). Herold et al. (2002) reported openness to experience allows trainees to better capitalize on earlier learning successes and to acquire necessary skills faster. This suggests intellectual curiosity enables trainees to explore, flexibly accept, and adopt new skills, although more research is needed to buttress existing findings.

Those trainees who were highly sociable (*extroverted*) in Barrick and Mount's classic work (1991) also exhibited higher training performance across multiple occupational categories (Rho = .26). To provide insights on how extroversion evidences itself in the training environment, Naquin and Holton (2002) suggest that extroversion influences trainees' motivation to improve their work performance through learning, which is typically a social process. Supporting the positive influence of sociability on transfer, Lemke, Leicht, and Miller (1974) found in a study of 64 undergraduates—stratified by ability and extroversion—that training in heterogeneous groups resulted in better transfer performance for low-ability individuals than did training in homogeneous groups. Suggested by these authors, a low-ability trainee is not likely to

develop a solution strategy on his own and thus the presence of an extrovert in a training group may increase verbalization of strategies, some of which are solution-relevant in the transfer stage. Relatedly, Olivera and Strauss (2004) found participating in a lab-based group puzzle solving task promoted higher individual transfer of learning due to cognitive sharing processes, whereas working alone did not. Further research in organizational settings on the extroversion–transfer link is warranted.

Conscientiousness has been shown to positively impact training proficiency (Barrick & Mount, 1991; Rho = .23) as well as trainees' confidence in their ability to learn (Martocchio & Judge, 1997). Although conscientiousness was reported in the Colquitt et al. (2000) meta-analysis as moderately correlated with transfer ($r_c = .29$), the authors found conscientiousness did not impact all training outcomes, including skill acquisition. They noted that correlations with conscientiousness seemed especially dependent on moderating factors. Perhaps conscientious trainees are unrealistic when assessing their actual learning improvement (Martocchio & Judge, 1997), engage in more distracting self-regulatory activities (Kanfer & Ackerman, 1989), or—as we advance—are more focused on imminent task completion versus developing new skills. Moving forward, Herold et al. (2002) specifically suggest that the perseverance component (i.e., a resolve to learn and transfer) and achievement component (i.e., a desire to attain and enact training goals) of conscientiousness be studied separately to isolate any differential effects on transfer. We note the achievement striving element may be a potential driving influence on transfer, as also suggested in a transfer review by Cheng and Ho (2001), by affecting motivation to learn (Colquitt et al., 2000).

Perceived Utility/Value

Transfer can be influenced by the perceived utility or value associated with training. Baumgartel, Reynolds, and Pathan (1984) showed that managers who believe in the utility of training or value the outcomes training will provide are more likely to apply skills learned in training. Axtell et al. (1997) found trainees who perceived training as relevant had higher levels of immediate skill transfer. Also, trainees' immediate training needs significantly affected their perceived learning transfer in Lim and Morris' (2006) study of 181 Korean employees who completed a 3-day training program. Perceived value or utility of training can be influenced by trainees' evaluation of: (1) the credibility of the new skills for improving performance, (2) a recognized need to improve their job performance, (3) a belief that applying new learning will improve performance, and (4) the practicality of the new skills for ease of transfer (Ruona et al., 2002; Warr & Bunce, 1995; Yelon, Sheppard, Sleight, & Ford, 2004). Put simply, for maximal transfer, learners should perceive that the new knowledge and skills will improve a relevant aspect of their work performance (Baldwin & Ford, 1988; Clark, Dobbins, & Ladd, 1993).

Furthermore, in a meta-analysis of training criteria Alliger, Tannenbaum, Bennett, Traver, and Shotland (1997) found that learner *utility* reactions (i.e., the extent trainees felt like training was useful to helping them perform on the job) were associated with transfer of learning more than trainees' affective or emotional reactions. One study, however, appears to question the weight of utility perceptions on transfer. Ruona et al. (2002) discovered utility reactions added minimal power as a predictor of motivation to transfer and argued that perceptions of utility of training provide nominal value in predicting transfer.

Career/Job Variables

Training transfer is also influenced by job and career variables in that trainees who rated high on these variables tended to perceive more potential benefits from a training intervention to enhance their current or future job performance (Clark et al., 1993; Facteau et al., 1995; Kontoghiorghes, 2002). *Career planning* deals with the extent employees create and update specific plans for achieving their goals and *career exploration* refers to the degree of career value and skill self-assessment activity. In the meta-analysis by Colquitt et al. (2000), the corrected correlation coefficient was .30 for the career planning–transfer relationship and lower, .22, for career exploration–transfer.

Relatedly, transfer is positively influenced by trainees' *job involvement* (Mathieu et al., 1992), which refers to the degree to which an employee identifies with her job, actively participates in it, and considers job performance important to her self-worth. As an example, Noe and Schmitt (1986) found that trainees with high job involvement were more motivated to transfer skills to the work setting. Pidd (2004) found that trainees who identified with workplace groups (described as employee and managers) reported higher transfer than those who did not have an affiliation or identification with work members or the organization. More specifically, learners' degree of *organization commitment*, evidenced by $r_c = .45$ in Colquitt et al. (2000) and an impressive $r = .61$ in Kontoghiorghes (2004), produces an interested learner who wants to gain and use new knowledge at work.

Locus of Control (LOC)

Although Tziner and Falbe (1993) found no significant relationships of LOC across four training outcomes, Tziner, Haccoun, and Kadish (1991) found trainees with an internal LOC exhibited higher levels of transfer when using a posttraining transfer intervention. Similarly, Baumgartel et al. (1984) found that managers high in internal LOC were more likely to apply new knowledge gained in training back at work. Colquitt et al. (2000) found those with an internal LOC were more motivated to learn; however, in their meta-analysis, *external LOC* was moderately related to transfer ($r_c = .27$).

Therefore, researchers must further examine the LOC–transfer linkage to gain clarity, with a focus toward moderating variables such as age or anxiety.

Summary of Learner Characteristics

Study of the learner characteristics factor rarely relies on anecdotal evidence; empirical studies abound. In fact, certain learner variables have been fairly well established as having important influences on transfer, including cognitive ability, self-efficacy, pretraining motivation, negative affectivity, perceived utility, and organization commitment variables. As illustrated in Figure 1, other individual-level variables exhibit mixed findings particularly conscientiousness, extrinsic versus intrinsic motivators, and external versus internal locus of control, and thus demand primary attention moving forward. Important will be establishing not just direct but interaction effects between such learner variables and transfer outcomes and then usefully incorporating these findings in needs assessment and transfer interventions. Indeed, Hogan, Hogan, and Roberts

Variable	Strong or Moderate relationship with transfer	Mixed Support	Minimal empirical research exists	Research is needed to clarify or to build findings
Cognitive ability	✓			
Self-efficacy	✓			
Pretraining motivation	✓			
Motivation to learn			✿	○
Motivation to transfer			✿	○
Extrinsic vs. intrinsic motivation		❖		○
Anxiety/ Negative affectivity	✓			
Conscientiousness		❖		○
Openness to experience	✓			○
Extroversion			✿	○
Perceived utility	✓			
Career planning	✓			
Organizational commitment	✓			
External vs. internal locus of control		❖		○

FIGURE 1:   Summary of the Learner Characteristics—Transfer Link

(1996) advocate considering personality dimensions in combination when analyzing performance, because the way each trait operates depends on other traits. As such, relevant research questions in this category include: What is the ultimate *profile* or combination of traits for trainees who struggle with transfer? How can trainers most efficiently develop such profiles for employees and utilize them? What transfer interventions will help this type of trainee transfer learned knowledge and skills on the job?

Ford and Weissbein's (1997) extensive review of trainee characteristics acknowledged improvements in using theoretical perspectives to guide the selection of learner characteristics to examine but indicated little had been studied on personality. This is an area that has improved since their review; the development of personality models over the last 10 to 15 years has no doubt fueled the improvements in this realm. A gap that remains is their call for research on trainees' prior experience, for which we found negligible coverage.

Intervention Design and Delivery

The second group of constructs that influence transfer directly or indirectly through their impact on learning includes intervention design and delivery. Specifically, we summarize prior work on the identification of learning needs, the identification of learning goals, content relevance, prominent instructional strategies and methods, self-management strategies, and instructional media as relevant to training transfer.

Needs Analysis

In the field of instructional systems design (ISD) a long-standing principle (see McGehee & Thayer, 1961) is that trainers must first assess the cause of a performance situation to ensure an appropriate intervention is employed. It has been estimated the bulk of performance problems stem from work environment causes such as unclear performance specifications, inadequate resources and support, inappropriate consequences, or untimely feedback (Rummler & Brache, 1995), and thus not the best candidates for a learning intervention. Training is best employed to address knowledge, skill, and ability deficits; therefore, appropriate needs analysis can be useful for determining whether training transfer is even relevant. Although a vast amount of conceptual support exists for using needs assessment to ensure the appropriate training needs are identified (Rossett, 1999; Swanson, 2003), there is a shortage of empirical support linking use of needs assessment to transfer outcomes. In a meta-analysis of the effect of organizational training used as an intervention, Arthur, Bennett, Edens, and Bell (2003) found that only 6% (22 of 397 studies) of organizations reported using a needs analysis in reports of training outcome findings, thus not allowing the authors to determine a clear pattern of results. The authors suggest that such a low percentage may not accurately reflect firms that use

needs analysis as a precursor to training. Arthur et al. (2003) speculate that participating firms may have overlooked reporting the use of needs assessment if they did not consider it of primary relevance for training design and delivery data (the focus of their study). Nonetheless, additional research is warranted to substantiate the vast anecdotal evidence supporting the relationship between needs assessment and training transfer.

Researchers further suggest including stakeholders in the design of training (Brinkerhoff & Montesino, 1995; Broad, 2005; Broad & Newstrom, 1992; Clark et al., 1993) and to use a needs analysis approach that specifically identifies obstacles to positive transfer (Gaudine & Saks, 2004). For example, Holton, Bates, and Ruona (2000) developed the Learning Transfer System Inventory (LTSI) as a diagnostic tool to assess the degree of support in the *transfer system* defined as all factors in the person, training, and organization that influence transfer of learning to job performance (pp. 335-336). The LTSI includes 16 factors that tap trainee perceptions of how their transfer of learning to performance would be impacted by aspects of the specific training program and general training issues. Trainers can use the results of learner responses to the LTSI to identify areas that may impair positive training transfer at the learner, design, and work climate levels. While the bulk of empirical work using the LTSI has been to validate the instrument with domestic and international samples (Khasawneh, Bates, & Holton, 2004; Yamnill & McLean, 2005) and to conduct correlational studies involving learner and organizational variables (Bates & Khasawneh, 2005; Seyler et al., 1998), there has been no published work linking the use of the LTSI to actual improvement in transfer outcomes.

Learning Goals

Presuming a learning intervention is needed, explicitly communicated objectives can inform learners of the desired performance, the conditions under which the performance will be expected to occur on the job, and the criterion of acceptable performance (Mager, 1962, 1997) to maximize transfer. Including specific behavioral objectives is a basic strategy used by trainers to illicit a desired behavior in the transfer environment (Gagne, 1965). Indeed, using goals (both assigned and participative goal setting) to increase training transfer has received much support in the extant literature (Locke, Shaw, Saari, & Latham, 1981; Richman-Hirsch, 2001; Taylor et al., 2005; Wexley & Baldwin, 1986; Wexley & Nemeroff, 1975). Goal-setting has been found to help individuals regulate their behavior by directing attention and action, mobilizing energy expenditure or effort, prolonging effort over time (i.e., persistence), and motivating the individual to develop relevant strategies for goal attainment (Brown, 2005; Locke & Latham, 2002; Locke et al., 1981)—all behaviors necessary for transfer.

In a study comparing trainee and manager perceptions of the importance of training objectives, Lee and Pucil (1998) found a significant relationship

between the importance of training goals and perceived transfer of training. The authors reasoned that trainees may focus more on maintaining the knowledge or skills in the work context when they and their manager perceive the specific training outcome as important. Kraiger, Salas, and Cannon-Bowers (1995) also found that transfer outcomes were higher for those participants who were provided learning objectives as advance organizers (i.e., background information) to the training program. And in a study of the relationship between the use of ISD components and transfer, Kontoghiorghes (2001) found that the development of learning goals and objectives was significantly correlated with transfer ($r = .37$, $p < .05$), indicating that participants are likely to transfer when they have a clear understanding of what knowledge and behaviors are required after training. From a practical perspective, Brown (2005) found that participants who set proximal (short-term) goals plus distal outcome goals reported increased transfer than those who set only distal outcome goals.

Content Relevance

According to Bates (2003) training goals and materials should also be content valid, or closely relevant to the transfer task. Drawing upon identical elements theory (Thorndike & Woodworth, 1901), trainers should keep the responses trainees make consistent from training environment to the job to ensure near transfer. Although content relevance has consistently been a critical cognitive component of instructional design approaches (Clark & Voogel, 1985), it has only in the last decade been empirically examined as a correlate with transfer outcomes (Holton et al., 2000; Lim & Morris, 2006; Rodriguez & Gregory, 2005). In their empirical work, Axtell et al. (1997) found that the content validity of the training information was highly correlated to transfer immediately after and at the 1 month mark after training ($r = .61$, .45, $p < .01$, respectively). And content relevance emerged as the primary factor in predicting trainee perceptions of successful transfer in a cross-sectional transfer study of Thai managers (Yamnill & McLean, 2005). Taken together, it appears that trainees must see a close relationship between training content and work tasks to transfer skills to the work setting, thus underscoring the utility of needs assessment in identifying appropriate training content.

Instructional Strategies and Methods

Researchers have also investigated how to design and teach for transfer (Machin & Fogarty, 2004); thus, as the instructional design literature continues to burgeon, numerous instructional strategies and methods have emerged to facilitate transfer (Russ-Eft, 2002). We review key instructional strategies and methods that have been specifically linked to transfer.

It has been suggested that learning interventions be designed to provide adequate *practice and feedback* to enhance long-term maintenance and application

of skills (Salas, Rozell, Mullen, & Driskell, 1999). In empirical studies, several authors found that cognitive or mental rehearsal and behavioral practice strategies during training are positively correlated with transfer (Ford & Kraiger, 1995; Holladay & Quinones, 2003; Warr & Allan, 1998). Research by Lee and Kahnweiler (2000), using a posttest only control group design ($n = 130$), found that providing participants with feedback, reinforcement, and remediation opportunities for learning mastery resulted in significantly higher transfer scores on a work task. In an extensive meta-analysis ($n = 8,980$), Donovan and Radosevich (1999) noted considerable support for distributed practice (i.e., taking breaks when practicing applying trained skills) for increasing learning, although measures for its impact on transfer were minimal.

As a design strategy, *overlearning* (i.e., repeated practice even after correct performance has been demonstrated) can improve transfer especially for skills that may go unused for long intervals; CPR training is an example (Fisk, Hertzog, Lee, Rogers, & Anderson, 1994; Fisk & Hodge, 1992). Overlearning works by creating automatic responses that conserve a trainee's cognitive resources so that cognitive ability may be dedicated to solving novel or more complex tasks. Fisk, Lee, and Rogers (1991) demonstrated that transfer of *automatized* task components is successful if the component is applied in a similar fashion across tasks (see also Czerwinski, Lightfoot, & Shiffrin, 1992; Rogers, 1992; Schneider & Fisk, 1984). We should note that Machin and Fogarty (2004) found no significant relationship between overlearning and intention to transfer skills (although overlearning was included with other transfer enhancement activities, which may have masked the effect of overlearning). In a meta-analysis on the effect of overlearning on retention ($n = 3,771$), Driskell, Copper, and Willis (1992) found that overlearning produces a moderate improvement ($d = 21.782$, $p < .0001$) in learner retention and that this effect differs by task type (cognitive vs. behavioral). For cognitive tasks, they found the magnitude of the overlearning effect was strongest immediately after training and diminished totally at 38 days. The authors chose the midpoint (19 days) as the "half-life of the over-learning effect" (p. 620) and suggested training refreshers or additional support would be needed (beyond overlearning) to attenuate the effect of subsequent retention decay.

Learners can experience *cognitive overload* (van Merrienboer, 1997) when attempting to understand and interpret too much or irrelevant information at one time, thus decreasing learning and transfer outcomes. Cognitive load theory, which recognizes learners' limited cognitive resources, should be considered by instructional designers for transfer implications. Cognitive load theory suggests that learners can only learn so much at one time (Chandler & Sweller, 1991) and that instructional designers should organize content such that it minimizes *extraneous load*, or information that is not necessary for learning, and maximize *germane load*, or information that directly contributes to learning (van Merrienboer, 1997).

In a review of empirical studies on task complexity, cognitive load, and transfer outcomes, van Merrienboer, Kester, and Paas (2006) note a *transfer paradox*—that is, strategies such as having trainees repeatedly practice on similar or exact tasks and providing frequent feedback on task performance—has been found to enhance learning mastery for complex tasks but has not carried over to support transfer of learning outcomes. To support transfer, these authors suggest a design strategy that reduces extraneous cognitive load by presenting learners with a whole–part approach to learning. The whole–part sequence involves first presenting learners with varying task elements through worked examples (i.e., examples work out to show learners correct solution steps) and completion problems (i.e., where a learner must complete a portion of the solution) and then increasing task complexity by using conventional problems such as case studies. Gradually presenting learners with different examples of a task and reducing the amount of performance feedback—called scaffolding—supports germane load by supporting learners' internal monitoring and feedback mechanisms. We should note that the proposed approach is speculative and relates to transfer of complex tasks only.

Active learning involves trainees in course material through carefully constructed activities (Myers & Jones, 1993; Silberman, 1998; Silberman & Auerbach, 2006), compared to passive instructional methods such as lecture. Active learning is thought to maintain the adult attention span (Middendorf & Kalish, 1996; Stuart & Rutherford, 1978), a likely precursor of transfer. In a meta-analysis of 95 studies of health and safety training methods, Burke et al. (2006) found that including active training methods (such as behavioral modeling, feedback, and dialogue) increased learning and decreased negative outcomes (such as injuries). In another study, the results of several experiments involving measures of retention of information at the end of a course indicated that discussion-based techniques were superior to lecture only (McKeachie, Pintrich, Lin, & Smith, 1987). Unfortunately, despite all the coverage in practitioner and educational magazines on active learning techniques, no prior studies examined transfer outcomes, thus revealing a critical gap.

Behavioral modeling (BM) is a logical, transfer-strategy-based research regarding self-efficacy (Bandura, 1997). Decker (1980) found that descriptive learning points (i.e., descriptions of a model's key behaviors) and rule-oriented learning points (i.e., descriptions of a model's key behaviors) enhance transfer generalization for novel tasks. In a replication of the prior study in an industrial training setting, Decker (1982) later found support for BM techniques on the generalization of a novel task in a work setting. Decker and Natham (1985) also found *rule codes* (i.e., learning points stated as rules to be followed) to be superior to learning points in helping trainees generalize behavior from a BM approach. In a behavioral modeling meta-analysis of 117 studies by Taylor et al. (2005) that evaluated 6 training outcomes, BM had greater effects on transfer when mixed models (both positive and negative) were used in interpersonal skills training programs. A mixed model means both effective and

ineffective behaviors are demonstrated for trainees to see a "good and bad" way to execute trained skills.

A related instructional strategy that has been studied to promote transfer is the use of *error-based examples*, or sharing with trainees what can go wrong if they do not use the trained skills back on the job. Smith-Jentsch, Jentsch, Payne, and Salas (1996) presented trainees with videotaped re-creations of airliner mishaps to create a perceived need for training. These authors had proposed that negative pretraining events enhanced trainee performance by increasing the perceived instrumentality of training to avoid negative outcomes (i.e., aviation mishaps). They found that the number of negative event types the trained pilots had previously experienced predicted their ability to apply the trained skill 1 week after training. Similarly, in Ivancic and Hesketh's study (2000) firefighters were exposed to error-based training (i.e., where trainees learn from others' mistakes), and they found that firefighters using detailed case studies reported higher transfer performance than those who were trained using error-free examples.

Self-Management Strategies

Self-management strategies work to equip trainees with necessary skills to help them transfer successfully back to the workplace, such as the use of self-generated positive feedback. Having trainees set specific, but challenging goals (Brown, 2005; Locke et al., 1981; Richman-Hirsch, 2001; Wexley & Baldwin, 1986), use action plans (Broad & Sullivan, 2002; Foxon, 1997), and engage in self-regulatory/management behaviors (Frayne & Latham, 1987; Gist, Bavetta, & Stevens, 1990; Latham & Frayne, 1989) have found conceptual and empirical support for direct and indirect effects on trainee transfer. Relapse prevention (RP), a well-grounded self-management model originating from clinical psychology, has been studied in the training transfer research for about 20 years, but its associated findings lack any comfortable measure of consistency (Burke & Baldwin, 1999; Gaudine & Saks, 2004; Richman-Hirsch, 2001; Wexley & Baldwin, 1986). Low sample sizes, inconsistent and incomplete tests of the model, self-report measures, and comparisons with indistinct transfer interventions have all made a fair test of RP intervention problematic. Given the sound grounding of the RP construct in social cognitive learning theory, training researchers likely owe RP a more stringent assessment to determine its worth as a transfer of training aid (Hutchins & Burke, 2006).

Technological Support

Emerging transfer technologies, largely anecdotally supported in the practitioner training literature, amplify the blurring line between training and constant on-the-job learning (Burke, 2001). Technological tools geared specifically toward transfer include e-coaching, nagware, and EPSS (Electronic Performance Support Systems). EPSS reinforce training and learning and

appear best used when a task is information intensive and job performance relies on information that periodically changes. A simple example of an EPSS is the paper clip in Microsoft Word® that answers on-the-spot questions posed by a learner. Unfortunately, empirical research in this area is scant and case evidence reigns supreme.

Eddy and Tannenbaum (2003) report a case example of an EPSS to maximize transfer for human resource professionals, referred to as gOEbase (www.gOEbase .com), which has extensive cross-reference linking. Traditionally, EPSS have provided transfer support for low discretion jobs, where people follow a lockstep process to complete a task, but gOEbase is designed for a high discretion job. Rossett and Mohr (2004) report on the usefulness of other simpler e-tools for supporting on the job performance such as in the U.S. Coast Guard, and Rossett and Marino (2005) detail various successes and uses of e-coaching. Providing an element of empirical support, Wang and Wentling (2001) studied an e-coaching program in which they found that online coaching improved transfer of training for participants from 18 countries, and in McManus and Rossett (2006) six experienced managers responded to a 12-item open-ended survey, claiming they were cautiously positive about EPSS, with five reporting "some success" in their firm's performance support systems. Empirical research is a must in this area.

Summary of Intervention Design

As illustrated in Figure 2, intervention design and delivery includes numerous established variables influencing transfer, mostly via their impact on learning, including learning goals, content relevant, practice and feedback, and behavioral modeling. However, of the three major categories of variables examined, this is the factor where quantitative research is most needed to establish or cement preliminary or case-based findings. A glaring gap is the paucity of empirical data to support widely touted active learning methods; although continuously advocated, they remain unsubstantiated in their effect on transfer. Perhaps more important, innovative technologies such as EPSS have been neglected in rigorous empirical transfer research and deserve our focus; some might say performance support technologies even make the transfer problem irrelevant. If indeed any element of this assertion shows promise, then transfer research may need to transform and potentially meld with the performance improvement literature. The most inconsistent findings surround particular self-management strategies, notably the effect of relapse prevention techniques on transfer.

Ford and Weissbein's (1997) review of the training design factor indicated that the cognitive and instructional psychology perspectives held promise for future research, specifically in the areas of error-based training, metacognitive skills, and goal orientation. We found a few studies surfaced on error based training. However, their call for research on the concept of guided learning

Variable	Strong or Moderate relationship with transfer	Mixed Support	Minimal empirical research exists	Research is needed to clarify or to build findings
Needs analysis			✿	○
Learning goals	✓			
Content relevance	✓			
Practice & feedback	✓			
Over-learning				○
Cognitive overload				○
Active learning			✿	○
Behavioral modeling	✓			
Error-based examples	✓			○
Self-management strategies		❖		○
Technological support			✿	○

FIGURE 2:   Summary of the Intervention Design—Transfer Link

remains largely neglected, and studies of metacognitive skills (to explore inter-ventions that increase trainees' responses to changing and novel conditions) and goal orientation (as a predictor of transfer) have only recently surfaced. As such, we provide relevant direction in our future research section.

Work Environment Influences

Another category of variables linked to training transfer encompasses work environment elements, which "view training in context" (Ford, 1997, p. 13). Research on work environment factors that influence transfer has notably expanded since Baldwin and Ford (1988) identified supervisory support and opportunity to perform as critical components of supporting trainee skill main-tenance. Researchers have explored the impact of the work environment on transfer by assessing variables independently and in aggregate as represented by a work environment or transfer climate factor. Both approaches have yielded positive effects for how transfer may be influenced via support, cues, and consequences that exist through work relationships and as a part of the overall work design. In this section, we discuss prior work on the strategic linkage of training, transfer climate, supervisory and peer support, opportunity to perform, and accountability.

Strategic Link

Learning and training interventions do not exist in a vacuum and as such we should consider their support of organizational goals and strategies. Montesino (2002) found a group of trainees who self-reported highest usage of training perceived a significantly higher alignment of the training program with the strategic direction of the organization. And Lim and Johnson (2002) found that Korean trainees perceived higher transfer when their learning outcomes matched trainees' departmental goals. In their case study, Watad and Ospina (1999) reported on a management development program that enabled participants to strategically link their local decisions and daily work operations to the broader organizational mission. They consequently discovered an improvement for organizational effectiveness and learning. More empirical studies could bolster claims that strategically linking training to organizational goals improves transfer to the job.

Transfer Climate

The importance of holistic and more systemic models of transfer takes into account various factors outside of the learning intervention (Ruona et al., 2002; Kontoghiorghes, 2002; Russ-Eft, 2002). Those situations and consequences in organizations that either inhibit or facilitate the use of what has been learned in training back on the job—referred in the literature as transfer climate (Rouiller & Goldstein, 1993)—have been shown to influence transfer outcomes directly (Kontoghiorghes, 2001; Lim & Morris, 2006; Mathieu et al., 1992; Tracey et al., 1995), indirectly as a moderator between individual or organizational factors and transfer (Burke & Baldwin, 1999), and as a correlate to transfer implementation intentions (Machin & Fogarty, 2004). Features of a positive transfer climate have been identified as cues that prompt trainees to use new skills, consequences for correct use of skills and remediation for not using skills, and social support from peers and supervisors in the form of incentives and feedback (Rouiller & Goldstein, 1993).

The corrected correlation coefficient between climate and transfer was moderately strong at .37 (cumulative sample size = 525) in Colquitt et al. (2000). Additionally, transfer climate has functioned to moderate the influence of posttraining transfer interventions, as found by Burke and Baldwin (1999) and Richman-Hirsch (2001), suggesting that climate should be considered before appending transfer intervention to training programs in hopes of increasing skill application. Specifically, Richman-Hirsch (2001) found trainees who perceived a supportive transfer climate were more likely to use goals to support transfer of skills from a customer service skills training than those that perceived an unsupportive transfer climate. Transfer climate also was found to help explain the relationship between organizational learning

culture and perceived innovation (Bates & Khasawneh, 2005), indicating that climate influences other learning dimensions outside of training programs.

Supervisor/Peer Support

Perhaps the most consistent factor explaining the relationship between the work environment and transfer is the support trainees receive to use their new skills and knowledge (Clarke, 2002). We review research on the role of supervisors and peers separate from transfer climate because each variable has been found to contribute a unique influence on training transfer across several studies.

Although a few researchers have found mixed findings for the role of supervisory support in positively influencing transfer (Awoniyi, Griego, & Morgan, 2002; Chiaburu & Marinova, 2005; Facteau et al., 1995; van der Klink, Gielen, & Nauta, 2001), the role of supervisors in influencing and supporting trainee transfer has been widely supported in both empirical and qualitative studies (Brinkerhoff & Montesino, 1995; Broad & Newstrom, 1992; Burke & Baldwin, 1999; Clarke, 2002). Foxon (1997) found that trainees' perception of managerial support for using skills on the job correlates with increased report of transfer ($r = .36$, p > .001). Researchers have identified manager supportive behaviors such as discussing new learning, participating in training, providing encouragement and coaching to trainees about use of new knowledge and skills on the job as salient contributors to positive transfer (McSherry & Taylor, 1994; Smith-Jentsch, Salas, & Brannick, 2001; Tannenbaum, Smith-Jentsch, & Behson, 1998). Lim and Johnson (2002) identified that discussions with supervisors on using new learning, supervisor's involvement in training, and positive feedback from supervisors were forms of support most recognized by trainees as positively influencing their transfer of learning.

Support from peers and colleagues have also proven to wield more consistent influence on trainee transfer than supervisory support (Facteau et al., 1995). When testing a model of individual and organizational support for transfer, peer support emerged as having the only significant relationship ($B = .65$, p < 0.05) with skill transfer in the modeled relationship; the other variables (supervisory support, self-efficacy, and goal orientation) affected skill transfer through pretraining motivation (Chiaburu & Marinova, 2005). In a qualitative study exploring which peer support behaviors were most influential on transfer, Hawley and Barnard (2005) found networking with peers and sharing ideas about course content helped promote skill transfer 6 months after training. However, despite the findings for peer support and trainee transfer, the lack of manager support participants perceived back on the job limited the positive influence of peer support on continued skill maintenance. Follow-up focus groups conducted 6 months after the training revealed that manager

support of transfer could be improved with a better alignment of organizational and training goals.

Opportunity to Perform

Research has consistently shown that positive transfer is limited when trainees are not provided with opportunities to use new learning in their work setting (Brinkerhoff & Montesino, 1995; Gaudine & Saks, 2004; Lim & Morris, 2006). Ford and Quinones (1992) found that airmen obtained differential opportunities to perform trained tasks and that these differences were related to supervisory attitudes. In Clarke (2002), limited opportunity to perform skills on the job was the highest impediment to successful training transfer. Notably, opportunity to use the trained skills was rated as the highest form of support for learners and the lack of opportunity to use training was rated as the biggest obstacle to transfer (Lim & Johnson, 2002). To provide opportunities, managers should consider modifying their employees' normal workload to allow them to practice new skills on the job (Clarke, 2002; Gregoire, 1994; Rooney, 1985) to further enhance transfer results. These findings might also suggest action planning or transfer discussions between learners and supervisors occur prior to training, although empirical support for such simple transfer interventions is rare.

Accountability

One understudied work environment variable is accountability, defined as the degree to which the organization, culture, and/or management expects learners to use trained knowledge and skills on the job and holds them responsible for doing so (Brinkerhoff & Montesino, 1995; Kontoghiorghes, 2002). Baldwin, Magjuka, and Loher (1991) found being held accountable for using new knowledge and skills signaled to trainees that transfer is important. According to Bates (2003), "assessment of transfer makes trainees, trainers, and others accountable for transfer success and helps create a culture that values learning and its application to the job" (p. 264). Longnecker's (2004) survey of 278 managers indicated that a primary learning imperative to increase transfer of learning is enhancing accountability for application, such as requiring a trainee's report posttraining. Russ-Eft (2002) also includes supervisory sanctions as a situational element that can enhance responsibility to transfer.

Summary of Work Environment

In the scheme of the transfer literature, work environment variables have only received increased attention in the last two decades, much to the literature's detriment since this group of variables is significantly influential for enhancing transfer. As illustrated in Figure 3, inconsistent findings are rare for

Variable	Strong or Moderate relationship with transfer	Mixed Support	Minimal empirical research exists	Research is needed to clarify or to build findings
Strategic link			✿	○
Transfer climate	✓			○
Supervisory support	✓	❖		○
Peer support	✓			
Opportunity to perform	✓			
Accountability			✿	○

FIGURE 3:   Summary of the Work Environment—Transfer Link

this factor, but additional work is needed to further clarify transfer climate as a factor. For example, multiple measures exist for measuring transfer climate, each with a different focus. Holton and his colleagues' (2000) LTSI measure has a transfer climate factor that assesses individual-level perceptions and attitudes about how performance (i.e., effort–performance expectations, performance self-efficacy, openness to change, performance–outcome expectations), feedback (i.e., performance coaching), and support (peer and supervisor) impact transfer of learning. In contrast, Tracey (1998) conceptualized and later validated (Tracey et al., 2001) a set of transfer support variables at the aggregate level, assuming transfer climate is a shared construct and can be represented by a single factor labeled work environment. Their model included items tapping external factors impacting transfer (e.g., support from manager, job, and organization). Despite their prior support for a single-factor model representing transfer climate, Tracey and Tews (2005) later substantiated a multifactor model (now referred to as the General Training Climate Scale) and found each set of items loaded on distinct factors, confirming a three-factor model.

Even though measures of transfer climate are in a state of transition, the influence of other situational influences on trainee skill maintenance continues to serve as a reliable factor in explaining training transfer. For example, research in the area of organizational learning culture (Awoniyi et al., 2002; Bates & Khasawneh, 2005; Egan, Yang, & Bartlett, 2004), as well as workplace design features (Kupritz, 2002), provides a broader understanding of how an organization's value of learning can impact performance resulting from training. Ultimately, we agree with calls that transfer be considered from a multidimensional perspective (which we expand upon later) to elucidate the relationships among situational and individual factors (Ford & Weissbein,

1997; Lim & Morris, 2006; Machin & Fogarty, 2004). Last, as Ford and Weissbein (1997) suggested, we should be mindful to explore transfer not just from an individual program perspective but also from a departmental, subunit, or organizational perspective.

Summary of the Literature Critique

With increasing exhaustive meta-analyses on training effectiveness over the last several decades, our knowledge of certain elements in Baldwin and Ford's (1988) conceptual model has become more comprehensive and established. However, some gaps linger in each major factor affecting transfer, despite Ford and Weissbein's (1997) call for specific research over a decade ago. As such, important opportunities to refine and validate comprehensive transfer theories remain. Notably, certain intervention design and work environment topics largely hinge upon anecdotal support and deserve attention, particularly active learning methods, technological support systems, strategic linkage, and accountability variables. In these efforts, field studies are necessary given the established importance of the work environment and elements within it, leaving little room for lab experiments, limited analytical approaches, linear models, or single source data. Next, we provide targeted direction for future research.

Research Recommendations

Conducting studies and gathering measures in studies of transfer can be taxing for any researcher wanting to contribute to the existing body of work. Indeed, access to organizations can be difficult; gathering multiple measures from multiple sources is thorny in the workplace; and random assignment of trainees (in experimental field studies) flies in the face of traditional needs assessment principles (Burke, 1996). Although strides have been made since Baldwin & Ford's review (1988), there remains sporadic methodological rigor, particularly in the overreliance of perceptual data and use of limited methodological and analytical approaches. By addressing such weaknesses, transfer researchers can produce more useful contributions.

Targeted Research Ideas

In terms of the intervention design factor, instructional methods beyond active learning—such as discovery learning, constructivist learning approaches, self-directed learning, action learning, and problem-based approaches—require scrutiny for their effect on transfer (Kirschner, Sweller, & Clark, 2006). The dependent variable typically studied for these strategies (if at all) is learning or cognitive outcomes, including declarative or procedural knowledge gains, thus indicating that the criterion issue in transfer studies still persists (Baldwin & Ford, 1988; Ford & Weissbein, 1997; Cheng & Ho, 2001). Therefore, whether

such conceptually supported learning methods actually help learners retain knowledge and skills in the workplace remains largely unexplored. Even though learning has been shown as moderately related to transfer ($r_c = .38$ in Colquitt et al., 2000), taking these studies to the next level of evaluation (i.e., transfer outcomes) would prove useful. Similarly, transfer and performance-oriented outcome research is needed to justify contemporary technological transfer aids such as e-coaching, nagware, and EPSS.

Another relevant domain of inquiry, falling under learner characteristics and commensurate with Ford and Weissbein's (1997) call for integrating cognitive sciences in training evaluation, includes learner metacognition and goal orientation. Although research in these areas has increased in the last decade, outcomes have been limited to learning or only indirectly test relationships to transfer. Metacognition is the ability for learners to self-monitor and regulate their learning strategies to maximize learning and performance (Ford et al., 1998). In a study of undergraduates in radar-operations training, Ford et al. (1998) found that individuals with higher mastery orientation (i.e., whose goals were focused more on learning mastery than out-performing others) engaged in more metacognitive strategies that lead to greater reports of knowledge, self-efficacy, in-training, and subsequent transfer performance. Similarly, Chiaburu and Marinova (2005) found mastery goal orientation strongly related to pretraining motivation ($B = .66$, p < 0.05), which was also related to transfer ($B = .24$, p < 0.05).

Research suggests that trainees' metacognitive ability and experience could function as substitutes for a supportive work environment in achieving transfer success. For example, in a study of how managers persisted in gaining proficiency, Enos, Kehrhahn, and Bell (2003) found managers persisted in gaining proficiency even when transfer climate factors failed to have a significant relationship with transfer of learning. According to Schraw (1998), and later supported in Schmidt and Ford's (2003) study of participants in web-based training, proficient individuals (compared to novices) may develop advanced metacognitive skills as their experience increases. Because managers in the Enos et al. (2003) study were experienced, the authors suggest a possible mediating effect of managers' metacognitive ability, allowing them to achieve desired objectives by actively seeking informal learning opportunities despite minimally supportive conditions. Therefore, the role of metacognition appears particularly relevant for organizations or subunits that possess limited stakeholder support to bolster transfer success.

With respect to work environment influences, a conceptual framework that may inform the role of accountability in transfer stems from Schlenker's (1997) *responsibility triangle* concept. Responsibility is defined as the psychological adhesive that connects a person to an event and to a set of prescriptions for his/her related work conduct. As captured in Schlenker's work, a person's level of responsibility is proposed to derive from the strength of links between the following three components (and their respective strength): (1) the

prescriptions that should guide the person's behavior (in our case, performance appraisals, development plans, pretraining agreements), (2) the event that occurs (e.g., training), and (3) characteristics of the person's identity, role, character, and aspirations (such as career or job utility variables, commitment). Ultimately, if prescriptions are clear and specific (i.e., prescription clarity link), the person is bound by the prescriptions because of his identity or role (i.e., personal obligation link), and the person is connected to the event by having personal control (i.e., personal control link) (Schlenker, 1997), then the person is viewed as responsible for the behavior or performance in question. Future transfer research grounded in established theory such as Schlenker's work would help researchers take a more multidimensional perspective of transfer.

Guiding Future Transfer Research

In this integrative review, we identified numerous published empirical studies across multiple disciplines dealing with major influences on training transfer (i.e., learner characteristics, intervention design and delivery, and work environment), critiqued and analyzed the current state of affairs for each factor influencing transfer, identified gaps that require clarification or further testing, noted important methods challenges, and suggested targeted research ideas. Although primarily descriptive, we believe our review will be particularly useful to new transfer scholars in formulating their research agendas in a meaningful course. In closing, we offer three overarching suggestions to guide empirical and theoretical work on transfer.

1. Future empirical research should directly assess transfer as the criterion variable.

Baldwin and Ford (1988) criticized the design of transfer studies, particularly the large volume of research that used short-term, single-source data to assess transfer outcomes. Fortunately, we found that researchers are beginning to overcome these specific validity issues by measuring transfer through multisource feedback (i.e., manager, peer, and trainee reports) and extending the transfer retention interval outward of 12 months. Moving forward, to provide a fair test of variables that affect transfer, future research can address the measurement criterion issue by directly assessing transfer outcomes. The research on personality and motivational variables is a good example; despite the recent attention given to the Big 5 personality variables as important predictors and correlates of transfer, scant studies have assessed transfer outcomes. Instead, many studies on individual-level variables assess transfer intentions, motivational aspects (such as motivation to improve performance through learning), or motivation to transfer, leaving only speculation as to whether these variables really contribute to sustained performance.

As an abundance of studies amass, researchers could begin to assess the continuity of transfer research. Whitley (2002) recommends using a mixed

methods approach to utilize the benefit of precision that meta-analyses afford through assessing reported effect sizes, yet the inclusiveness of studies is often associated with narrative reviews. Combining methods to create a "best evidence" literature review (Slavin, 1987) would include using a narrative review to identify potential conceptual and methodological intervening variables and to organize studies across categories (qualitative, quantitative with effect sizes, and quantitative studies that an effect size was not reported and cannot be computed). Researchers could then compare results across categories and suggest implications from the findings.

2. Future research should validate the utility of various transfer practices in organizations to provide a closer connection between practice and research.

Based on our review, a fair amount of the support for organizational transfer practices is limited to case studies and/or conceptual articles. Practitioners and researchers across disciplines, and specifically in HRD, have long called for a more fluid exchange of ideas between empirical and applied inquiry (Ford, 1997; Huint & Saks, 2003; Kuchinke, 2004; Salas, Cannon-Bowers, & Blickensderfer, 1997). Researchers have been encouraged to make findings easier for managers to understand, to partner with practitioners on applied research, and to align research pursuits with pressing firm needs (Berger, Kehrhahn, & Summerville, 2004; Montesino, 2002).

However, as Swanson (2005) illustrates in his cyclical model of research in organizations, practice can drive research and theory by providing pressing challenges and novel issues that stunt organizational performance. Best practices, or even commonly used practices, applied in organizations are limited in generalizability if they have not undergone the rigor of empirical testing or drawn from established theory. Thus, future research should consider empirically linking workplace needs analyses processes, active learning methods, simple transfer interventions (e.g., action planning), and performance support technologies to transfer outcomes. Providing these tests would ground anecdotal and potentially faddish best practices with scientifically verifiable results, thus providing evidence to guide training design. As suggested by Latham (2001), "knowledge derived from practice should inform the journals" (p. 202).

3. Research should theorize and assess training transfer as a multidimensional phenomenon with multilevel influences.

Emerging transfer research has allowed for a more systemic view of the transfer process than previously recognized. For example, the recent proliferation of different lenses stemming from sociotechnical (Kontoghiorghes, 2004), sociopolitical (Kim, 2004), cognitive (van Merrienboer et al., 2006), behavioral (Gaudine & Saks, 2004), and cultural (Egan et al., 2004) factors further elucidates how transfer is a multidimensional process, a realization

now gaining empirical ground. In addition, several researchers have undertaken the challenge of validating comprehensive models of transfer (cf. Holton et al., 2000; Kontoghiorghes, 2004; Tracey & Tews, 2005), thus providing evidence that transfer is affected by multilevel variables (Kozlowski & Salas, 1997). A common theme in current work is the need to view transfer from a systemic (rather than linear) multilevel perspective and to incorporate variables that have been found to have consistently strong relationships with transfer, such as informal learning practices (Enos et al., 2003) and organizational learning culture (Bates & Khasawneh, 2005), to better represent the challenge of transforming learning to performance.

As transfer models become more comprehensive and robust, researchers must consider how to best capture and assess multiple factors impacting transfer. Kozlowski and Salas (1997) acknowledge that examining components of a system's framework can be conceptually powerful, but cumbersome in practice. Relevant to transfer, we see the challenge as one of administrative feasibility; that is, how will researchers collect data on the myriad of factors without causing participant fatigue? Kozlowski and Salas (1997) suggest using a "levels of analysis" perspective in capturing the interrelatedness of individual, intervention, and organizational factors separately, while maintaining the integrity of the system as whole. Holton et al.'s (2000) work on the LTSI as a transfer diagnostic tool is a good example of such an approach, although its use is for diagnostic purposes only. The LTSI is a validated transfer system inventory including 16 factors composed of 68 items measuring individual, intervention, and work environment factors (with an additional 21 items under review to increase reliability). Although the LTSI provides an initial assessment of trainee perceived factors impacting transfer and is effective for planning purposes in the post-training context, it does not measure transfer directly thus limiting inferences concerning relationships with transfer outcomes (Kirwan & Birchall, 2006).

A few transfer researchers are using mixed methodologies to capture transfer data (see Lim & Johnson, 2002). The pairing of qualitative methods such as focus groups, fieldwork, and interviews with quantitative methods allows social science researchers to study cultural and social phenomena and triangulate data from an interpretive approach, while providing alternative sources for data and theory generation. Moving forward, the strategic and tactical guidance offered by Kozlowski & Salas (1997) could effectively steer the continued theoretical development of transfer so that the study of the transfer system both segments factors and retains linkages composing the system as a whole.

Notes

1. Our work environment factor captures the "organizational influences" and "post-training" factors described in the Salas et al. (1999) model.

2. The majority of variables in this article are buttressed by ample empirical support; two variables, however, do not fit this profile. Needs analysis is included in the article based on long-standing conceptual support, and technological tools are included due to assorted case data.

References

Alliger, G. M., Tannenbaum, S. I., Bennett, W. Jr., Traver, H., & Shotland, A. (1997). A meta-analysis of the relations among training criteria. *Personnel Psychology*, *50*, 341–358.

Alvarez, K., Salas, E., & Garofano, C. M. (2004). An integrated model of training evaluation and effectiveness. *Human Resource Development Review*, *3*(4), 385–416.

Arthur Jr., W., Bennett Jr., W., Edens, P., & Bell, S. T. (2003). Effectiveness of training in organizations: A meta-analysis of design and evaluation features. *Journal of Applied Psychology, 88*(2), 234–245.

Awoniyi, E. A., Griego, O. V., & Morgan, G. A. (2002). Person—environment fit and transfer of training. *International Journal of Training and Development, 6*(1), 25–35.

Axtell, C. M., Maitlis, S., & Yearta, S. K. (1997). Predicting immediate and longer term transfer of training. *Personnel Review*, *26*(3), 201–213.

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology*, *41*, 63–105.

Baldwin, T. T., Magjuka, R. J., & Loher, B. T. (1991). The perils of participation: Effects of choice of training on training motivation and learning. *Personnel Psychology, 44*, 51–65.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*, 122–147.

Bandura, A. (1997). *Self efficacy: The exercise of control.* New York: Freeman and Co.

Barrick, M. R., & Mount, M. K. (1991). The big five personality dimensions and job performance: A meta-analysis. *Personnel Psychology, 41*, 1–26.

Bates, R. A. (2003). *Managers as transfer agents: Improving learning transfer in organizations.* San Francisco, CA: Jossey Bass.

Bates, R. A., & Khasawneh, S. (2005). Organizational learning culture, learning transfer climate and perceived innovation in Jordanian organizations. *International Journal of Training and Development*, *9*(2), 96–109.

Baumgartel, H. J., Reynolds, M. J. I., & Pathan, R. Z. (1984). How personality and organizational climate variables moderate the effectiveness of management development programmes: A review and some recent research findings. *Management and Labour Studies*, *9*(1), 1–16.

Berger, N. O., Kehrhahn, M. T., & Summerville, M. (2004). Research to practice: Throwing a rope over the divide. *Human Resource Development International, 7*(3), 403–409.

Brinkerhoff, R. O., & Montesino, M. U. (1995). Partnerships for training transfer: Lessons from a corporate study. *Human Resource Development Quarterly*, *6*(3), 263–274.

Broad, M. L. (2005). *Beyond transfer of training: Engaging systems to improve performance.* San Francisco, CA: John Wiley & Sons.

Broad, M. L., & Newstrom, J. W. (1992). *Transfer of training: Action packed strategies to ensure high payoff from training investments.* Reading, MA: Addison-Wesley.

Broad, M. L., & Sullivan, R. (2001). Improving performance in international settings: Strategies for transfer of learning. Paper presented at the *ASTD International Conference and Exposition*, Orlando, FL.

Brown, T. (2005). Effectiveness of distal and proximal goals as transfer of training intervention: A field experiment. *Human Resource Development Quarterly*, *16*(3), 369–387.

Brown, T. C., & Morrissey, L. M. (2004). The effectiveness of verbal self guidance as a transfer of training intervention: Its impact in presentation performance, self-efficacy, and anxiety. *Innovations in Education and Teaching International*, *34*, 276–285.

Burke, L. A. (1996). What you REALLY need to know about conducting field research in training. *Human Resource Development Quarterly*, *7*(4), 369–380.

Burke, L. A. (2001). *High impact training solutions*. Westport, CT: Quorum.

Burke, L. A., & Baldwin, T. T. (1999). Workforce training transfer: A study of the effect of relapse prevention training and transfer. *Human Resource Management*, *38*(3), 227–243.

Burke, M. J., Sarpy, S. A., Smith-Crowe, K., Chan-Serafin, S., Salvador, R. O., & Islam, G. (2006). Relative effectiveness of worker safety and health training methods. *American Journal of Public Health*, *96*(2), 315–324.

Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction*, *8*, 293–332.

Cheng, E. W. L., & Ho, D. C. K. (2001). A review of transfer of training studies in the past decade. *Personnel Review, 30*, 102–118.

Chiaburu, D. S., & Marinova, S. V. (2005). What predicts skill transfer? An exploratory study of goal orientation, training self-efficacy and organizational supports. *International Journal of Training and Development, 9*, 110–123.

Clark, R. E., & Voogel, A. (1985). Transfer of training principles for instructional design. *Educational Communication and Technology Journal*, *33*(2), 113–123.

Clark, S. C., Dobbins, G. H., & Ladd, R. T. (1993). Exploratory field study of training motivation: Influence of involvement, credibility, and transfer climate. *Group & Organization Management*, *18*, 292–307.

Clarke, N. (2002). Job/work environment factors influencing training effectiveness within a human service agency: Some indicative support for Baldwin and Fords' transfer climate construct. *International Journal of Training and Development*, *6*(3), 146–162.

Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology, 85*(5), 678–707.

Czerwinski, M. P., Lightfoot, N., & Shiffrin, R. M. (1992). Automatization and training in visual search. *American Journal of Psychology: Special Issue on Views and Varieties of Automaticity, 105*, 271–315.

Day, E., Arthur, W., & Gettman, D. (2001). Knowledge structures and the acquisition of a complex skill. *Journal of Applied Psychology*, *86*, 1022–1033.

Decker, P. J. (1980). Effects of symbolic coding and rehearsal in behavior-modeling training. *Journal of Applied Psychology*, *65*(6), 627–634.

Decker, P. J. (1982). The enhancement of behavior modeling training of supervisory skills by the inclusion of retention processes. *Personnel Psychology*, *35*(2), 323–332.

Decker, P. J., & Nathan, B. R. (1985). *Behavior modeling training: Principles and applications.* New York: Praeger.

Donovan, J. J., & Radosevich, D. J. (1999). A meta-analytic review of the distribution of practice effect: Now you see it, now you don't. *Journal of Applied Psychology, 84*(5), 795–805.

Driskell, J. E., Copper, C., & Willis, R. P. (1992). Effect of overlearning on retention. *Journal of Applied Psychology, 77*(5), 615–622.

Eddy, E. R., & Tannenbaum, S. I. (2003). Transfer in an e-learning context. In E.F. Holton & T.T. Baldwin (Eds.), *Improving learning transfer in organizations* (pp. 161–194). San Francisco, CA: John Wiley.

Egan, T. M., Yang, B., & Bartlett, K. R. (2004). The effectives of organizational learning culture and job satisfaction on motivation to transfer learning and turnover intention. *Human Resource Development Quarterly, 15*(2), 279–301.

Enos, M. D., Kehrhahn, M. T., & Bell, A. (2003). Informal learning and the transfer of learning: how managers develop proficiency. *Human Resource Development Quarterly*, *14*(4), 369–387.

Facteau, J. D., Dobbins, G. H., Russell, J. E. A., Ladd, R. T., & Kudisch, J. D. (1995). The influence of general perceptions of the training environment on pre-training motivation and perceived training transfer. *Journal of Management*, *21*, 1–25.

Fisk A. D., Hertzog, C., Lee, M., Rogers, W., & Anderson, G. (1994). Long-term retention of skilled visual search. *Psychology and Aging*, *9*, 206–215.

Fisk, A. D., & Hodge, K. A. (1992). Retention of trained performance in consistent mapping search after extended delay. *Human Factors*, *34*, 147–164.

Fisk, A. D., Lee, M. D., & Rogers, W. A. (1991). Recombination of automatic processing components: The effects of transfer, reversal, and conflict situations. *Human Factors*, *33*, 267–280.

Ford, J. K. (1997). Advances in training research and practice: An historical perspective. In J. K. Ford (Ed.), *Improving training effectiveness in work organizations* (pp. 1–16). Mahwah, NJ: Lawrence Erlbaum.

Ford, J. K., & Kraiger, K. (1995). The application of cognitive constructs and principles to the instructional systems model of training: Implications for needs assessment, design, and transfer. In C. L. Cooper & I. T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology*, *10*, 1–48.

Ford, J. K., Quinones, M. A., Sego, D. J., & Sorra, J. S. (1992). Factors affecting the opportunity to perform trained tasks on the job. *Personnel Psychology*, *45*, 511–527.

Ford, J. K., Smith, E. M., Weissbein, D. A., Gully, S. M., & Salas, E. (1998). Relationships of goal orientation, metacognitive activity and practice strategies with learning outcomes and transfer. *Journal of Applied Psychology*, *83*, 218–233.

Ford, J. K., & Weissbein, D. A. (1997). Transfer of training: An updated review and analysis. *Performance Improvement Quarterly*, *10*(2), 22–41.

Foxon, M. (1997). The influence of motivation to transfer, action planning, and manager support on the transfer process. *Performance Improvement Quarterly, 10*(2), 42–63.

Frayne, C., & Latham, G. P. (1987). Application of social learning theory to employee self-management of attendance. *Journal of Applied Psychology, 72*(3), 387–392.

Gagne, R. M. (1965). *The conditions of learning*. New York: Holt, Rinehart, and Winston, Inc.

Gaudine, A. P., & Saks, A. M. (2004). A longitudinal quasi-experiment on the effects of post-training transfer interventions. *Human Resource Development Quarterly*, *15*(1), 57–76.

Georgenson, D. L. (1982). The problem of transfer calls for partnership. *Training and Development Journal, 36*, 75–78.

Gist, M. E. (1986). The influence of training method on self-efficacy and idea generation among managers. *Personnel Psychology*, *42*, 787–805.

Gist, M. E. (1989). The influence of training method on self-efficacy and idea generation among managers. *Personnel Psychology*, *42*, 787–805.

Gist, M. E., Bavetta, A. G., & Stevens, C. K. (1990). Transfer training method: Its influence on skill generalization, skill, repetition, and performance level. *Personnel Psychology*, *43*(3), 501–523.

Gist, M. E., Schwoerer, C., & Rosen, B. (1989). Effects of alternative training methods on self-efficacy and performance in computer software training. *Journal of Applied Psychology, 74*, 884–891.

Gist, M. E., Stevens, C. K., & Bavetta, A. G. (1991). Effects of self-efficacy and post-training intervention on the acquisition and maintenance of complex interpersonal skills. *Personnel Psychology, 44*, 837–861.

Gregoire, T. K. (1994). Assessing the benefits and increasing the utility of addiction training for public child welfare workers: A pilot study. *Child Welfare*, *73*, 69–81.

Harrison, A. W., Rainer, R. K., Jr., Hochwarter, W. A., & Thompson, K. R. (1997). Testing the self-efficacy-performance linkage of social-cognitive theory. *Journal of Social Psychology, 137*(1), 79–87.

Hawley, J. D., & Barnard, J. K. (2005). Work environment characteristics and implications for training transfer: A case study of the nuclear power industry. *Human Resource Development International*, *8*(1), 65–80.

Herold, D. M., Davis, W., Fedor, D. B., & Parsons, C. K. (2002). Dispositional influences on transfer of learning in multistage training programs. *Personnel Psychology*, *55*(4), 851–869.

Hogan, R., Hogan, J., & Roberts, B. (1996). Personality measurement and employment decisions: Questions and answers. *American Psychologist*, *51*, 469–477.

Holladay, C. L., & Quinones, M. A. (2003). Practice variability and transfer of training: The role of self-efficacy generality. *Journal of Applied Psychology*, *88*(6), 1094–1103.

Holton, E. F., Bates, R., & Ruona, W. E. A. (2000). Development of a generalized learning transfer system inventory. *Human Resource Development Quarterly, 11*(4), 333–360.

Huint, P., & Saks, A. M. (2003). Translating training science into practice: A study of managers' reactions to post-training interventions. *Human Resource Development Quarterly, 14*(2), 181–198.

Hutchins, H., & Burke, L. A. (2006). Has relapse prevention received a fair shake? – A review and implications for future transfer research. *Human Resource Development Review*, *15*(1), 8–24.

Ivancic, K., & Hesketh, B. (2000). Learning from errors in a driving simulation: Effects on driving skill and self confidence. *Ergonomics*, *43*(12), 1966–1984.

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/-aptitude–treatment interaction approach to skill acquisition. *Journal of Applied Psychology*, *74*(4), 657–690.

Khasawneh, S., Bates, R. A., & Holton, E. F., III. (2004). *Construct validation of an Arabic version of the Learning Transfer System Inventory (LTSI) for use in Jordan.* In T. M. Egan & M. L. Morris (Eds.), *Proceedings of AHRD conference* (pp. 66–73). Bowling Green, OH: Academy of Human Resource Development.

Kim, H. (2004). Transfer of training as a sociopolitical process. *Human Resource Development Quarterly, 15*(4), 497–501.

Kirwan, C., & Birchall, D. (2006). Transfer of learning from management development programmes: Testing the Holton model. *International Journal of Training & Development*, *10*, 552–268.

Kirshner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, exponential and inquiry-based teaching. *Educational Psychologist*, *41*(2), 75–86.

Kontoghiorghes, C. (2001). Factors affecting training effectiveness in the context of the introduction of new technology – A US case study. *International Journal of Training and Development*, *5*, 248–260.

Kontoghiorghes, C. (2002). Predicting motivation to learn and motivation to transfer learning back to the job in a service organization: A new systemic model for training effectiveness. *Performance Improvement Quarterly*, *15*, 114–129.

Kontoghiorghes, C. (2004). Reconceptualizing the learning transfer conceptual framework: Empirical validation of a new systemic model. *International Journal of Training and Development, 8*(3), 210–221.

Kozlowski, S. W. J., & Salas, E. (1997). An organizational systems approach for the implementation and transfer of training. In J. K. Ford (Ed.), *Improving training effectiveness in work organizations* (pp. 247–290). Mahwah, NJ: Lawrence Erlbaum.

Kraiger, K., Salas, E., & Cannon-Bowers, J. A. (1995). Measuring knowledge organization as a method for assessing learning during training. *Human Factors*, *37*, 804–816.

Kuchinke, K. P. (2004). Theorizing and practicing HRD: Extending the dialogue over the roles of scholarship and practice in the field. *Human Resource Development International, 7*(4), 535–549.

Kupritz, V. W. (2002). The relative impact of workplace design on training transfer. *Human Resource Development Quarterly, 13*(4), 427–447.

Latham, G. P. (2001). The reciprocal transfer of learning from journals to practice. *Applied Psychology: An International Review, 50*(2), 201–251.

Latham, G. P., & Frayne, C. A. (1989). Self-management training for increasing job attendance: A follow-up and a replication. *Journal of Applied Psychology*, *74*(3), 411–417.

Lee, C. D., & Kahnweiler, W. M. (2000). The effect of a mastery learning technique on the performance of a transfer of training task. *Performance Improvement Quarterly*, *13*(3), 125–139.

Lee, K., & Pucil, D. J. (1998). The perceived impacts of supervisor reinforcement and learning objective importance on transfer of training. *Performance Improvement Quarterly*, *11*(4), 51–61.

Lemke, E. A., Leicht, K. L., & Miller, J. C. (1974). Role of ability and extroversion in concept attainment of individuals trained in heterogeneous or homogeneous personality groups. *Journal of Educational Research*, *67*(5), 202–204.

Lim, D. H., & Johnson, S. D. (2002). Trainee perceptions of factors that influence learning transfer. *International Journal of Training and Development*, *6*(1), 36–48.

Lim, D. H., & Morris, M. L. (2006). Influence of trainee characteristics, instructional satisfaction, and organizational climate on perceived learning and training transfer. *Human Resource Development Quarterly*, *17*(1), 85–115.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*, 705–717.

Locke, E. A., Shaw, K. N., Saari, L. M., & Latham, G. P. (1981). Goal setting and task performance: 1969–1980. *Psychological Bulletin, 90*, 125–152.

Longnecker, C. O. (2004). Maximizing transfer of learning from management education programs: Best practices for retention and application. *Development and Learning in Organizations, 18*(4), 4–6.

Machin, M. A., & Fogarty, G. J. (2004). Assessing the antecedents of transfer intentions in a training context. *International Journal of Training & Development*, *8*(3), 222–236.

Mager, R. F. (1962). *Preparing instruction objectives.* Belmont, CA: Fearon Publishers.

Mager, R. F. (1997). *Making instruction work: A step-by-step guide to designing and developing instruction that works.* Atlanta, GA: The Center for Effective Performance.

Martocchio, J. J., & Judge, T. A. (1997). Relationship between conscientiousness and learning in employee training: Mediating influences of self-deception and self-efficacy. *Journal of Applied Psychology*, *82*, 764–773.

Mathieu, J. E., Martineau, J. W., & Tannenbaum, S. I. (1993). Individual and situational influences on the development of self-efficacy: Implications for training effectiveness. *Personnel Psychology*, *46*, 125–147.

Mathieu, J. E., Tannenbaum, S. I., & Salas, E. (1992). Influences of individual and situational characteristics on measures of training effectiveness. *Academy of Management Journal*, 35, 828–847.

McGehee, W., & Thayer, P. W. (1961). *Training in business and industry*. New York: Wiley.

McKeachie, W. J., Pintrich, P. R., Lin, Y., & Smith, D. A. (1987). *Teaching and learning in the college classroom: A review of the research literature.* University of Michigan: NCRIPTAL.

McManus, P., & Rossett, A. (2006). Performance support tools: Delivering value when and where it is needed. *Performance Improvement, 45*(2), 8–16.

McSherry, M., & Taylor, P. (1994). Supervisory support for the transfer of team-building training. *The International Journal of Human Resource Management*, *5*(1), 107–119.

Middendorf, J., & Kalish, A. (1996). The "change-up" in lectures. *Teaching Resources Center Newsletter*, 5. Retrieved September 9, 2005, from http://www.iub.edu/~teaching/changeups.shtml

Montesino, M. U. (2002). A descriptive study of some organizational-behavior dimensions at work in the Dominican Republic: Implications for management development and training. *Human Resource Development International*, *5*(4), 393–410.

Morin, L., & Latham, G. P. (2000). The effect of mental practice and goal setting as a transfer of training intervention on supervisors' self-efficacy and communication skills: An exploratory study. *Applied Psychology: An International Review*, *49*(3), 566–579.

Myers, C., & Jones, T. (1993). *Promoting active learning: Strategies for the college classroom.* San Francisco: Jossey-Bass.

Naquin, S. S., & Holton III, E. F. (2002). The effects of personality, affectivity, and work commitment on motivation to improve work through learning. *Human Resource Development Quarterly*, *13*(4), 357–376.

Noe, R. A. (1986). Trainee attributes and attitudes: Neglected influences on training effectiveness. *Academy of Management Review, 11*, 736–749.

Noe, R. A., & Schmitt, N. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology*, *39*, 497–523.

Olivera, F., & Straus, S. G. (2004). Group-to-individual transfer of learning: Cognitive and social factors. *Small Group Research*, *35*, 440–465.

Pidd, K. (2004). The impact of workplace support and workplace identity on training transfer: an Australian case study. *International Journal of Training and Development, 8*(4), 274–288.

Quinones, M. A. (1995). Pretraining context effects: Training assignment as feedback. *Journal of Applied Psychology*, *80*, 226–238.

Ree, M. J., & Earles, J. A. (1991). Predicting training success: Not much more than g. *Personnel Psychology, 44*, 321–332.

Richman-Hirsch, W. L. (2001). Posttraining interventions to enhance transfer: The moderating effects of work environments. *Human Resource Development Quarterly*, *12*(2), 105–120.

Robertson, I., & Downs, S. (1979). Learning and the prediction of performance: Development of trainability testing in the United Kingdom. *Journal of Applied Psychology*, *64*(1), 42–50.

Rodriguez, C. M., & Gregory, S. (2005). Qualitative study of transfer of training of student employees in a service industry. *Journal of Hospitality & Tourism Research*, *29*, 42–66.

Rogers, M. E. (1992). Nursing science and the space age. *Nursing Science Quarterly*, *5*, 27–34.

Rooney, R. H. (1985). Does in-service training make a difference? Results of a pilot study of task-centered dissemination in a public social service setting. *Journal of Social Service Research*, *8*, 33–50.

Rossett, A. (1999). *First things fast: A handbook for performance analysis*. San Francisco: Jossey-Bass Pfeiffer.

Rossett, A., & Marino, G. (2005). If coaching is good, then e-coaching is…. *T & D*, *59*, 46–49.

Rossett, A., & Mohr, E. (2004). Performance support tools: Where learning, work and results converge. *T & D*, 58, 34–39

Rouiller, J. Z., & Goldstein, I. L. (1993). The relationship between organizational transfer climate and positive transfer of training. *Human Resources Development Quarterly*, *4*, 377–390.

Rummler, G. A., & Brache, A. P. (1995). *Improving performance: How to manage the white space on the organizational chart*. San Francisco: Jossey-Bass Publishers.

Ruona, W. E. A., Leimbach, M., Holton III, E. F., & Bates, R. (2002). The relationship between learner utility reactions and predicted learning transfer among trainees. *International Journal of Training & Development*, *6*(4), 218–228.

Russ-Eft, D. (2002). A typology of training design and work environment factors affecting workplace learning and transfer. *Human Resource Development Review, 1*(1), 45–65.

Sackett, P. R., Gruys, M. L., & Ellingson, J. E. (1998). Ability-personality interactions when predicting job performance. *Journal of Applied Psychology*, *83*(4), 545–556.

Saks, A. M. (1995). Longitudinal field investigation of the moderating and mediating effects of self-efficacy on the relationship between training and newcomer adjustment. *Journal of Applied Psychology*, *80*, 211–225.

Saks, A. M. (2002). So what is a good transfer of training estimate? A reply to Fitzpatrick. *The Industrial-Organizational Psychologist*, *39*, 29–30.

Salas, E., Cannon-Bowers, J. A., & Blickensderfer, E. L. (1997). Enhancing reciprocity between training theory and practice: Principles, guidelines, and specifications. In J. K. Ford, S. Kozlowski, K. Kraiger, E. Salas, & M. Teachout (Eds.), *Improving training effectiveness in the work organizations* (pp. 19–46), Mahwah, NJ: Erlbaum.

Salas, E., Cannon-Bowers, J. A., Rhodenizer, L., & Bowers, C. A. (1999). Training in organizations: Myths, misconceptions, and mistaken assumptions. In G. Ferris (Ed.), *Research in personnel and human resources management* (vol. 17, pp. 123–161), Greenwich, CT: JAI Press Inc.

Salas, E., Rozell, D., Mullen, B., & Driskell, J. E. (1999). The effect of team building on performance. *Small Group Research*, *30*(3), 309–330.

Santos, A., & Stuart, M. (2003). Employee perceptions and their influence on training effectiveness. *Human Resource Management Journal, 13*, 27–45.

Schlenker, B. R. (1997). Personal responsibility: Applications of the triangle model. *Research in Organizational Behavior*, *19*, 241–301.

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, *26*(1/2), 113–126.

Schmidt, A. M., & Ford, J. K. (2003). Learning within a learner control environment: The interactive effects of goal orientation and metacognitive instruction on learning outcomes. *Personnel Psychology*, *56*, 405–429.

Schneider, W., & Fisk, A. D. (1984). Automatic category search and its transfer. *Journal of Experimental Psychology*: *Learning, Memory, and Cognition*, *10*(1), 1–15.

Seyler, D. L., Holton III, E. F., Bates, R. A., Burnett, M. F., & Carvalho, M. A. (1998). Factors affecting motivation to transfer training. *International Journal of Training & Development*, *2*(1), 16–17.

Silberman, S. (1998). Ex Libris: The joys of curling up with a good digital reading device. *Wired, 7*, 98–104.

Silberman, M., & Auerbach, C. A. (2006). *Active training: A handbook of techniques, designs case examples, and tips* (3rd ed.). San Francisco, CA: Jossey-Bass/Pffeiffer.

Slavin, R. E. (1987). Best evidence synthesis: An alternative to meta-analytic and traditional reviews. In W. R. Shadish & C. S. Reichardt (Eds.), *Evaluation studies: Review annual*, (vol. 12., pp. 667–673). Thousand Oaks, CA: Sage Publications.

Smith-Jentsch, K. A., Jentsch, F. G., Payne, S.C., & Salas, E. (1996). Can pretraining experiences explain individual differences in learning. *Journal of Applied Psychology, 81(*1), 110–116.

Smith-Jentsch, K. A., Salas, E., & Brannick, M. T. (2001). To transfer or not to transfer? Investigating the combined effects of trainee characteristics, team leader support, and team climate. *Journal of Applied Psychology*, *86*(2), 279–292.

Stevens, C. K., & Gist, M. E. (1997). Effects of self-efficacy and goal orientation training on negotiation skill maintenance: What are the mechanisms? *Personnel Psychology*, *50*, 955–978.

Stuart, J., & Rutherford, R. J. (1978). Medical student concentration during lectures. *The Lancet*, *2*, 514–516.

Swanson, R. A. (2003). Transfer is just a symptom: The neglect of front-end analysis. In E. F. Holton III & T. T. Baldwin (Eds.). *Improving learning transfer in organizations* (pp. 119–137), San Francisco, CA: Jossey-Bass.

Swanson, R. A. (2005). The challenge of research in organizations. In R. A. Swanson & E. F. Holton (Eds.), *Research in organizations: Foundations and methods of inquiry* (pp. 11–26). San Francisco, CA: Berrett-Koehler.

Tannenbaum, S. I., Mathieu, J. E., Salas, E., & Cannon-Bowers, J. A. (1991). Meeting trainees' expectations: The influence of training fulfillment on the development of commitment, self-efficacy, and motivation. *Journal of Applied Psychology*, *76*, 759–769.

Tannenbaum, S. I., Smith-Jentsch, K. A., & Behson, S. J. (1998). Training team leaders to facilitate team learning and performance. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training*. (pp. 247–270). Washington DC: American Psychological Association Press.

Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. *Annual Review of Psychology*, *43*, 399–441.

Taylor, P. J., Russ-Eft, D. F., & Chan, D. W. L. (2005). A meta-analytic review of behavior modeling training. *Journal of Applied Psychology*, *90*(4), 692–709.

Thorndike, E. L., & Woodworth, R. S. (1901). The influence of improvement in one mental function upon the efficiency of other functions. *Psychological Review*, *8*, 247–261.

Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resources Development Review*, *4*, 356–367.

Tracey, J. B. (1998). A three-dimensional model of the transfer of training climae. In W. E. K. Lehman & M. Cavanaugh (co-chairs), *Recent trends in the study of transfer climate: Research, theory, and consultation*. Symposium presented at the Annual Meeting of the Society for Industrial and Organizational Psychology, Dallas.

Tracey, J. B., Hinkin, T. R., Tannenbaum, S., & Mathieu, J. E. (2001). The influence of individual characteristics and the work environment on varying levels of training outcomes. *Human Resource Development Quarterly*, *12*(1), 5–23.

Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: The importance of the work environment. *Journal of Applied Psychology*, *80*, 239–252.

Tracey, J. B., & Tews, M. J. (2005). Construct validity of a general training climate scale. *Organizational Research Methods*, *8*(4), 353–374.

Tziner, A., & Falbe, C. M. (1993). Training-related variables, gender and training outcomes: A field investigation. *International Journal of Psychology*, *28*, 203–221.

Tziner, A., Haccoun, R. R., & Kadish, A. (1991). Personal and situational characteristics influencing the effectiveness of transfer of training improvement strategies. *Journal of Occupational Psychology*, *64*, 167–177.

van der Klink, M. R., Gielen, E., & Nauta, C. (2001). Supervisory support as a major condition to enhance transfer. *International Journal of Training and Development*, *5*(1), 52–63.

van Merrienboer, J. J. G. (1997). *Training complex cognitive skills: A four-component instructional design model for technical training.* Englewood Cliffs, NJ: Educational Technology Publications.

van Merrienboer, J. J. G., Kester, L., & Pass, F. (2006). Teaching complex rather than simple tasks: Balancing intrinsic and germane load to enhance transfer of learning. *Applied Cognitive Psychology*, *20*, 343–352.

Wang, L., & Wentling, T. L. (2001, March). *The relationship between distance coaching and the transfer of training.* Proceedings from the Academy of Human Resource Development Conference. Tulsa, Oklahoma.

Warr, P. B., & Allan, C. (1998). Learning strategies and occupational training. In C. L. Cooper & I. T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology* (pp. 83–121). London: Wiley.

Warr, P. B., & Bunce, D. (1995). Trainee characteristics and the outcomes of open learning. *Personnel Psychology*, *48*, 347–375.

Watad, M., & Ospina, S. (1999). Integrated managerial training: A program for strategic management development. *Public Personnel Management*, *28*, 185–197.

Webster, J., & Martocchio, J. J. (1993). Turning work into play: Implications for microcomputer software training. *Journal of Management*, *19*, 127–146.

Wexley, K. N., & Baldwin, T. T. (1986). Post-training strategies for facilitating positive transfer: An empirical exploration. *Academy of Management Journal*, *29*, 503–520.

Wexley, K. N., & Nemeroff, W. F. (1975). Effectiveness of positive reinforcement and goal setting as methods of management development. *Journal of Applied Psychology*, *60*(4), 446–450.

Whitley, B. E. Jr. (2002). Integrative literature reviewing. In M. W. Wiederman & B. E. Whitley Jr. (Eds.), *Handbook for conducting research on human sexuality* (pp. 393–422). Mahwah, NJ: Lawrence Erlbaum Associates.

Yamnill, S. & McLean, G. N. (2001). Theories supporting transfer of training. *Human Resource Development Quarterly, 12*(2), 195–208.

Yamnill, S., & McLean, G. N. (2005). Factors affecting transfer of training in Thailand. *Human Resource Development Quarterly*, *16*(3), 323–344.

Yelon, S., Sheppard, L., Sleight, D., & Ford, J. K. (2004). Intention to transfer: How do autonomous professionals become motivated to use new ideas? *Performance Improvement Quarterly*, *17*(2), 82–103.