

Transfer of Training: An Updated Review and Analysis

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ABSTRACT

This study updates the Baldwin and Ford (1988) review of the empirical articles published on training transfer. The updated review and analysis revolves around the four key limitations noted in the original review: (1) the criterion problem of how and when to measure training transfer, (2) the generalizability of results from training design studies, (3) the choice of which trainee characteristics to examine for their impact on transfer, and (4) the conceptualization and operationalization of work

environment factors that can impact transfer. Twenty studies were found in the literature since the 1988 review on training transfer. An analysis of these studies found that progress has been made in addressing many of the limitations noted by Baldwin and Ford. This paper concludes with a discussion of future research directions for training transfer research relevant to each of the four areas of criterion measurement, training design, trainee characteristics, and work environment.

There is a growing recognition of the "transfer problem" in organizational training as concerns are raised that much of what is trained fails to be applied in the work setting. This concern has become even stronger given today's changing job requirements, the view of people as the key to competitive advantage, and the movement towards learning as a key mechanism for fully utilizing human resources.

In 1988, Baldwin and Ford reviewed and critically analyzed the literature devoted to training transfer. Examination of transfer issues requires a clear understanding of what is meant by transfer as well as the identification of factors that affect the extent to which knowledge and skills are transferred to the work environ-

ment. They organized their review of training transfer around the model presented in Figure 1. The model incorporates six linkages among training inputs, training outputs, and the conditions of transfer.

The conditions of transfer include both the generalization of knowledge and skills acquired in training to the job and the maintenance of that learning over time on the job. Training outcomes include the knowledge, skills, and affect (Kraiger, Ford, & Salas, 1993) acquired as a function of training and the retention of the training content.

They also identified three types of training input factors that can impact training outcomes and training transfer: 1) training design, 2) trainee characteristics, and 3) work

environment factors. Training design factors include the incorporation of learning principles, the sequencing of training material, and the job relevance of the training content. Trainee characteristics include ability, skill, motivation, and personality factors of the trainee. Work environment factors include transfer climate, social support from supervisors and peers, as well as the constraints and opportunities to perform learned behaviors on the job. This model of training inputs, outcomes, and conditions of transfer was used as a framework for a critical review of the empirical research on training transfer.

The purpose of the present paper is to provide an updated review and analysis of the empirical research that has been created over the past nine years since the original review by Baldwin and Ford. Our review is focused on four key issues that Baldwin and Ford identified as research limitations. We analyze the transfer literature since 1988 relevant to these four issues. This targeted review examines the extent to which the literature has addressed key limitations raised in the original review. Our paper concludes with suggested areas for future research.

Transfer Review and Analysis

Baldwin and Ford (1988) noted four limitations to the training transfer literature: 1) the criterion problem of how transfer is defined and operationalized; 2) the low complexity of the tasks used to examine the impact of training design factors on learning and transfer; 3) the lack of conceptual frameworks to drive the choice of trainee characteristics to

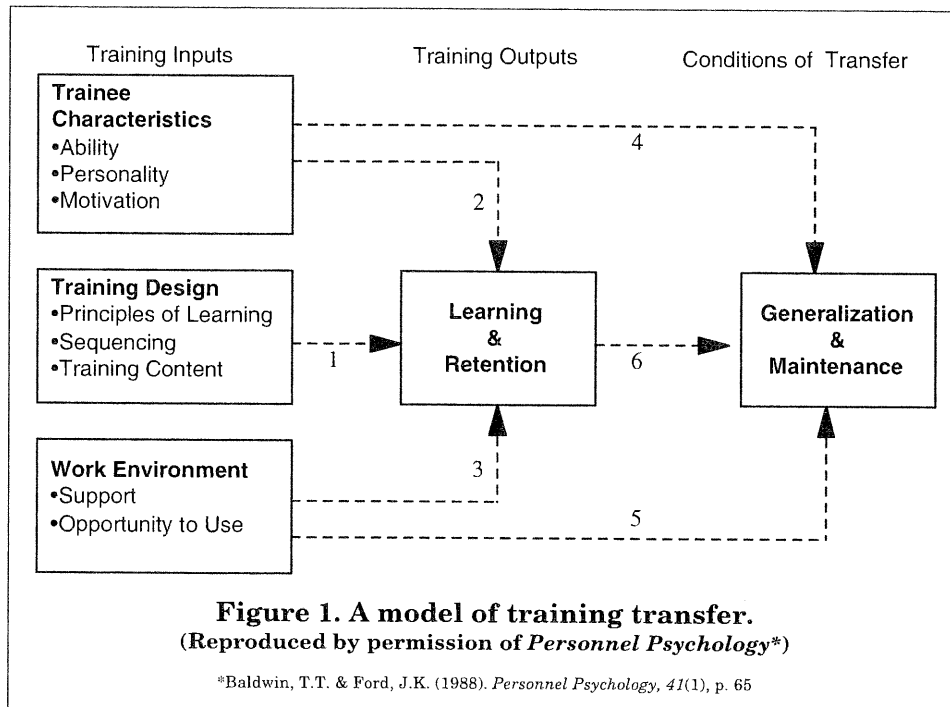
examine in transfer research; and 4) the lack of attention to clearly conceptualize and operationalize key work environment factors such as climate, support and opportunity to perform.

For this updated review, we focused on published peer-reviewed research. We found twenty empirical papers that examined linkages identified in the model from Figure 1 to training transfer. Studies using samples of young school-aged children or which only examined training outcomes and not conditions of transfer were eliminated from this review. In addition, the many technical reports from military studies or published papers which discuss transfer issues but fail to provide any empirical tests are not included in this review.

Table 1 presents a summary of the articles which includes the authors and date of publication; the research sample; the type of training program; variables which affected the training such as the training design, trainee characteristics, and/or work environment factors examined in the study; the research design employed; the criterion measures of training transfer used; and a brief summary of the results of the individual studies. Each of the four limitations are described below followed by a review and analysis of the current empirical research based on this sample of twenty studies.

The Criterion "Problem"

A key contribution of Baldwin and Ford (1988) was the emphasis on the criterion problem in transfer research. The criterion problem can be summarized as a lack of attention to define the multidimensional nature of training transfer and the limited operationalization of transfer constructs. The measures chosen, im-



pacts how one interprets the results of the studies and the extent to which one can generalize results to other samples, organizations, or training processes. The studies typically used learning and short-term retention (near transfer) or self-reports of intentions to use trained knowledge and skills. These types of measures are clearly inadequate for drawing conclusions about training transfer.

For our updated review, we found a greater variety of measures and time intervals were used to evaluate transfer. The measurement types included more objective behavioral measures, supervisory and peer ratings, and self-ratings. For example, four studies (Baldwin, 1992; Gist, Bavetta, & Stevens, 1990; Gist, Stevens & Bavetta, 1991, Smith-Jentsch, Jentsch, Payne, & Salas, 1996) had raters view post-training perfor-

mance in a controlled or standardized setting. This has the advantage of clearly identifying the extent to which trainees have maintained their skills and can generalize the skills to other situations than those previously trained. Other studies employed objective measures of transfer such as faster performance (Swezey, Perez, & Allen, 1991), the use of trained strategies (Gist et al., 1990; 1991), and the increased accuracy of performance (Kraiger, Salas, & Cannon-Bowers, 1995; Lintern, Sheppard, Parker, Yates, & Nolan, 1989).

A number of studies used supervisory or peer judgements to evaluate transfer. These studies showed that researchers have given more careful attention to developing specific measures to capture the transfer of key knowledge and skills trained rather than rely solely on an overall rating

Table 1
Review of Transfer Studies

Author(s)	Sample	Task/Training Content	Variables	Design	Criteria	Results
Baldwin (1992)	72 Business students	Assertive communication skills	Scenario variability, & model competency variability	Experimental (random assignment of those attending)	Learning score, behavioral reproduction & generalization, (immediate & after 1 month)	Model variability led to increased generalizing of the behavior; the positive models only group reproduced the behavior to a higher level.
Brinkerhoff & Montesino (1995)	70 trainees, 5 courses, Fortune 200 Company	Meeting, negotiation, team, & communication skills	Management support — before & after training discussions	Experimental (random assignment of those attending)	Self-reported degree of transfer (1.5 months after training)	Supervisor discussions with trainees increased reported transfer.
Facteau, Dobbins, Russell, Ladd, & Kudisch (1995)	967 managers & supervisors	Management training	Training motivation, compliance, intrinsic & extrinsic incentives, career exploration, & planning, commitment, support task constraints	Survey	Self Reported Transfer	Pretraining motivation, subordinate, peer, & supervisor support predicted transfer.
Ford, Quinones, Segó, Sorra (1992)	180 Air Force graduates of training program & their supervisors	Equipment used to support aircraft	Type of base, supervisor attitudes, support, work flow, ability, & self-efficacy.	Survey	Self-reported opportunity to perform skills (4 months after assignment)	Supervisory attitudes, workgroup support, self-efficacy and ability were related to various dimensions of opportunity to perform.

**Table 1
(continued)**

Author(s)	Sample	Task/Training Content	Variables	Design	Criteria	Results
Gist, Bavetta, & Stevens (1990)	68 MBA students	Dyadic negotiation skills	Post-training maintenance intervention: Goal setting & self-management training	Experimental (random assignment of those in training)	Performance, strategy use, repetition rate (2 weeks after training)	Self-management intervention led to better transfer performance & strategy use while goal setting led to greater skill repetition.
Gist, Stevens, & Bavetta (1991)	79 MBA students	Dyadic negotiation skills	Trainee self-efficacy, & post-training maintenance intervention: Goal-setting or self-management training, goal level	Experimental (random assignment of those in training)	Cognitive learning & simulation exercise negotiating performance (before & 6 weeks after training)	Self-efficacy related to performance & maintenance. Self-management training attenuated this relationship, goal setting training accentuated it.
Gopher, Weil, & Bareket (1994)	58 cadets in the Israeli Air Force flight school	Flying skills in performance aircraft	Computer game training, embedded training strategies (specific skills part task versus coping with processing demands using whole task)	Quasi-experimental (trainees matched on abilities selected into groups)	Two instructors' ratings of general performance in a jet trainer, likelihood of continuing, & ratings on 3 skills (over 8 flights)	Game group had better transfer & did better than the control group on jet trainer performance. Specific skills training led to better training performance, but not transfer.
Kraiger, Salas, & Cannon-Bowers (1995), study 2	40 undergraduates	Complex Naval decision making task (TANDEM)	Structural assessment of "closeness" (C) to an expert model & timing of advanced organizers, before or after training	Experimental	Structural assessment, closeness to expert model, performance on a simulation	C was higher, & related to performance, for those receiving the advanced organizer before training.

Table 1
(continued)

Author(s)	Sample	Task/Training Content	Variables	Design	Criteria	Results
Lintern, Roscoe, & Koonce, & Segal (1990)	42 adult flight students	Aircraft landing skills	Simulator practice (2 hours), augmented feedback (2 types, adaptive feedback & guidance)	Quasi-experimental (trainees matched on gender, all novices)	Number of attempted plane landings before solo (after 17 flight hours)	Training reduced the number of pre-solo flights needed.
Lintern, Sheppard, Parker, Yates, & Nolan (1989)	85 student Naval aviators	Aircraft attack maneuver	Simulator practice, level of training trial physical fidelity features: scene detail, field of view	Quasi-experimental	Distance from the center of bombing target over 6 flights	The first 24 simulator trials led to better performance. Specific features did not alter transfer.
Paas (1992)	46 technical school students	Statistics (computerized training)	Training strategy (conventional problems, worked out problems, & completion problems)	Experimental (random assignment of those in training)	Performance on statistics test involving near & far transfer (immediately after training)	Worked problems improved near transfer, worked & completion problems improved far transfer relative to the conventional problems.
Quinones, Ford, Segal, & Smith (1995)	118 Air Force training graduates & their supervisors	Equipment used to support aircraft	Learning, career motivation, locus of control, supervisor attitudes & work group support	Survey	Self-reported opportunity to perform trained skills (4 months after assignment)	Learning, & career motivation, were related to supervisor attitudes. Supervisor attitudes & support predicted opportunity to perform.

Table 1
(continued)

Author(s)	Sample	Task/Training Content	Variables	Design	Criteria	Results
Rouiller & Goldstein (1993)	102 manager trainees & 919 of their supervisors/subordinates	Management of fast food restaurant	Unit (store) climate aggregated if more than 1 person completed the survey, trainee learning, & unit performance	Survey	Supervisor & personnel transfer ratings, Manager's performance summary (8-12 weeks after assignment)	Learning & climate were related to transfer. Transfer behavior was related to performance.
Smith-Jentsch, Jentsch, Payne, & Salas (1996)	32 pilots in a cockpit resource mgt. program	Team performance related assertiveness	Training versus control, previous negative events in domain (biodata)	Experimental (random assignment of those in training)	Two raters on ability to use assertiveness in a simulation (1 week after training)	Negative events pilots experienced led to more assertiveness due to training.
Swezey, Perez, & Allen (1991)	120 under-graduates	Electro-mechanical troubleshooting	Static vs. moving displays, procedural, conceptual or integrated (both) training strategies	Experimental	Task simulator performance, hands-on transfer task, abstract transfer task, knowledge test (all immediate & after 1 week)	Procedural had less errors but took longer on task. Knowledge also predicted hands-on performance. Conceptual & integrated performed better on the abstract task. Display type did not matter.
Tesluk, Farr, Mathieu, & Vance (1995)	252 employees, supervisors attending training, 88 units	Employee involvement (EI) training	Manager's attitude & behaviors toward EI, participative climate, commitment, EI activity, cynicism, & belief in improbability	Survey	Self-report of individual generalization of training	EI activity, commitment, cynicism, & belief in improbability were related to transfer. Climate was significantly related to transfer but in a negative direction.

**Table 1
(continued)**

Author(s)	Sample	Task/Training Content	Variables	Design	Criteria	Results
Tracey, Tannenbaum, & Kavanagh (1995)	505 managers, 52 super-markets	Management skills	Learning, pre & post-training behaviors (supervisor ratings), transfer climate, continuous learning climate.	Survey	Supervisor ratings of post-training behavior (6-8 weeks after training)	Pre-training behavior, transfer climate, & learning climate were all related to transfer.
Tziner, Haccoun, & Kadish (1991)	81 Israeli IDF trainees	Advanced training methods	Post-training relapse prevention, environmental support, motivation to transfer, mastery	Experimental (random assignment of trainees)	Self-report & supervisor ratings of training, & transfer strategy use (10 weeks after training)	RP led to mastery & increased reported strategy use; supervisors rated more skill use. Support & internal locus also led to transfer.
Warr & Buncce (1995)	106 junior managers	Managerial skills	Open learning training, motivation, anxiety for training, learning activities, behavioral learning strategies, biodata	Survey	Supervisors rated learning, changes in job behavior, & reactions (immediate & after 3 months)	Motivation related to knowledge. Attitude, learning strategy, & age predicted learning. Tenure & learning predicted transfer with younger managers more likely to apply training to the job.
Xiao (1996)	106 workers in China	Electronics	Application orientation, match of employee knowledge, skills, & abilities to work design, rewards, supervision, peer support.	Survey	Self-reported output of transfer behaviors, scrap rates (nine months after training)	Learning related to performance. Work characteristics related to transfer & scrap. Close supervision & match of worker's abilities to work design were most influential. Peer support also related to transfer.

of performance or transfer. Seven of the twenty studies, though, employed self-report measures of transfer. In general, the studies were more rigorous in their approach to measuring transfer than found in the previous review. For example, Facticeau, Dobbins, Russell, Ladd, and Kudisch (1995) developed behaviorally anchored rating scales to improve the accuracy of the self-report measures. Tracey, Tannenbaum, and Kavanagh (1995) provided a self-measure that was specifically tied to training content or expected outcomes rather than general statements as to whether they have or intend to transfer skills.

Although self-reports can be a reasonable alternative, one's perceptions of transfer may be affected by social desirability, cognitive dissonance, and memory distortions. For example, Tziner, Haccoun, and Kadish (1991) employed self-report and supervisory ratings of skill use and strategy implementation relevant to a relapse prevention program. The self-ratings of skill use and strategy were not significantly correlated with the supervisory ratings. The self-ratings indicated greater skill use as well as strategy implementation. Yet, supervisory ratings indicated that although supervisors felt that trainees

were using skills more, they were not engaged in more strategy implementation. The divergent results illustrate the need to use multiple criterion measures (beyond self-report) for developing a more comprehensive understanding of training transfer.

Task Characteristics and Training Design

A second limitation found in the previous review was that a majority of

training design studies used simple motor and memory skills completed in laboratory settings with college students. Short-term retention was the criterion measure. These types of tasks (climbing ladders, tossing bean bags, learning the names of hypothetical people) do not approach the more complex, organizationally relevant tasks that employees must learn and transfer (Kraiger,

1995). This problem of drawing conclusions was discussed by Schmidt and Bjork (1992). They reviewed studies that showed that traditional learning principles such as using massed training, providing immediate feedback, and using a constant training stimulus may improve acquisition and immediate retention but have detrimental effects on long range transfer.

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fer studies are now using more complex tasks, more diverse samples, and using longer intervals between training and criterion assessment to demonstrate transfer. For example, Baldwin (1992) examined the effects of scenario and model competency variability on the learning and transfer of assertive communication skills. These skills were meaningful to the business students who signed up for the training, and complex in that the training involved teaching six different learning points: clear speaking, honesty, persistence, dealing with manipulation or sidetracking, accepting faults without apology, and checking for closure. In addition, the researcher assessed both behavioral reproduction (a learning measure) and the ability to generalize the assertiveness skills to a relevant situation involving a confederate after a retention interval of four weeks.

Other studies have examined transfer of complex flight skills from games or simulators to actual flight—typically over a series of transfer flights. For example, Gopher, Weil, and Bareket (1994) investigated the effects of training Israeli Air Force students on a computer game which embedded either whole skill training aimed at allowing trainees to develop coping skill for the high processing demands or part-task training aimed at improving specific skills. Transfer was assessed using ratings from two flight instructors over eight flights in a high performance jet trainer.

Despite the progress, one remaining problem is the use of overall measures of effectiveness rather than examining specific dimensions of transfer. Without such specificity, it is difficult to tease apart why design factors do or do not affect transfer. An

exemplary study comes from Gist et al. (1990), who made clear which transfer processes they wanted to assess (e.g., the types of skills that should be applied, when they should be applied, and in what sequence the skills should be exhibited in the transfer setting). Many studies, though, only measured the overall outcome of effectiveness in the transfer setting. For example, Lintern, Roscoe, Koonce, and Segal (1990) used the number of pre-solo landings attempted before being allowed to solo to assess training effectiveness. Although the number of solo landings attempted is a useful effectiveness measure, the underlying process of transfer was ignored. To better understand what skills had transferred, instructors could have also provided more specific ratings about the skill performance they saw which convinced them their trainee was prepared to fly solo (i.e., which skills, how often performed, how effectively).

The Choice of Trainee Characteristics

A third limitation cited by Baldwin and Ford (1988) was the lack of theoretical frameworks to guide research on trainee characteristics. As an example, they highlighted the importance of trainee motivation and the need to incorporate theoretical perspectives such as the expectancy theory to help guide choices as research design characteristics. In addition, while a number of different variables had been investigated, models of how and under what conditions these trainee characteristics should impact transfer were not specified.

Our review indicates that progress has been made in using theoretical models to drive the choice of

trainee characteristics to study. Fecteau et al. (1995) used conceptual frameworks from the career development literature and the motivational perspective of expectancy theory to develop a theoretical model of pre-training factors that can impact learning and transfer. These factors included such characteristics as career exploration, career planning, motivation to learn, and the potential for obtaining intrinsic/extrinsic incentives. Another line of research has applied social learning concepts such as self-efficacy to examine the impact of trainee confidence in his/her ability to perform trained tasks on training transfer (Ford et al., 1992; Gist et al., 1991; Warr & Bunce, 1995). Recent conceptual advances in research on anxiety was applied to

studying the impact of both learning task anxiety and interpersonal anxiety on learning and transfer of managerial skills (Warr & Bunce, 1995).

The current research has advanced our understanding of the motivational factors involved in training transfer. On the other hand, there was less attention to other trainee characteristics such as personality factors and prior experience. The studies reviewed only examined a small number of issues such as tenure, age, and managerial experience (Warr & Bunce, 1995); locus of

control (Ford, Quinones, Segó, and Sorra, 1992); and individual cynicism (Tracey et al., 1995). Much more work can be done on investigating the impact of individual difference factors on learning and transfer. For example, in the employee selection literature, there has been increased attention to personality factors such as the "big five" that predict future performance on the job (Barrick & Mount, 1991). These factors include

conscientiousness, openness to experience, extraversion, emotional stability, and agreeableness. It is reasonable to expect that personality factors might not only be predictive of future job performance but also impact an individual's motivation to learn, learning strategies used during training, skill acquisition rates,

and training transfer. As one example, individuals open to new experiences may be more likely to try to transfer training to new settings and situations.

Advances to the Study of the Work Environment

One conclusion from the 1988 review was the empirical support that work environment factors such as support, transfer climate, and opportunity are critical factors impacting transfer. Yet, there was a critical need to more clearly operationalize

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key environmental constructs such as the transfer climate and the opportunity to perform trained tasks. Most studies measured these factors at a global, overall level rather than exploring the multidimensional nature of the constructs. In addition, the empirical research up to that time was correlational in nature. There were not any studies where interventions were incorporated into the research design to show how changing a work environment characteristic impacted transfer.

In our review, we found much effort had been devoted to a greater understanding and measurement of the work environment in which the trainee was suppose to transfer his/her new knowledge and skills. Rouiller and Goldstein (1993) developed an extensive transfer climate survey based on social learning theory. They identified a number of situational cues (goals, social, task, and self-control cues) and a number of consequences to performance of trained tasks (positive, negative, and no feedback). This approach highlights how theory can move us beyond thinking of training transfer as a simple process and provides practitioners with avenues for changing dysfunctional workplace climates.

Similarly, Ford et al. (1992) investigated the "opportunity to perform" construct relevant to training transfer. They defined opportunity as the extent to which a trainee is provided with or actively obtains work experiences relevant to the tasks for which he or she was trained. They identified three dimensions of opportunity including breadth (the number of trained tasks used on the job), activity level (the number of times each trained task is performed on the job),

and task type (the difficulty or criticality of the trained tasks performed on the job). They found support for the multidimensional nature of opportunity and found trainee characteristics (e.g., self-efficacy) and work environment characteristics (supervisory support) were critical factors impacting the opportunity trainees received to perform trained tasks on the job.

There was also one study that intervened to change a work environmental factor—supervisory support—and to see its impact on training transfer (Brinkerhoff & Montesino, 1995). The researchers designed a study where supervisors had discussions with trainees prior to training regarding course content, importance of the training to the job, and expectations as to how training could be applied to the job. In addition, supervisors discussed issues concerning post-training with the trainees including the extent to which the trainee learned the material, what barriers the trainee might envision while applying the training to the job, and an emphasis on supervisory expectations regarding the use of trained skills to improve job performance. Results supported the use of the intervention strategies to improve training transfer.

This updated review, then, has found that advancements have been made in increasing our understanding of work environment constructs and for linking the work environment to transfer outcomes. Nevertheless, more progress could be made in developing strategies for actively intervening in changing work environmental factors and examining their impact on learning and transfer. Only in this way can we begin to suggest practical ways

for practitioners to improve transfer performance.

Future Research Directions

Our review indicates that progress has been made in addressing the limitations highlighted by Baldwin and Ford (1988). We conclude this review and analysis with four specific directions for future research that hold promise for improving our understanding of training transfer.

Conditions of transfer

Transfer has typically been defined as the extent to which knowledge and skills acquired in a training setting are generalized and maintained over a period of time in the job setting. Generalization involves more than mimicking trained responses to events that occurred in training; it requires trainees to exhibit trained behaviors in response to different settings, people, and situations from those trained. Maintenance issues focus on the changes that occur in the form or level of knowledge, skills, or behaviors exhibited in the transfer setting as a function of time elapsed from the completion of the training program.

As noted by Smith, Ford, and Kozlowski (in press), emerging research in cognitive and instructional

psychology contends that a third key indicator of transfer is the extent to which the trainee can adapt to novel or changing situational demands. For example, Holyoak (1991) has described the difference between building for adaptive versus routine expertise. With routine expertise, the trainee can quickly apply solutions or strategies to well-learned and familiar contexts. This notion is similar to that of training generalization. In contrast, adaptability is defined as the capability to adjust one's knowledge and skills in the face of novel situations or requirements.

The strongest form of adaptability occurs when effectiveness in the transfer setting requires the use of trained knowledge and methods to generate new approaches and strategies (Patrick, 1992). Thus, adaptability can be examined as the extent

to which individuals recognize when trained methods are not appropriate or effective, new methods must be learned, and/or new strategies must be considered given increasing levels of task complexity. This is consistent with calls by Royer, Cisero, and Carlo (1993) and others to study more intensely an individual's capacity for "learning how to learn." Research is needed that identifies and measures changes in these high performance

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skills of adaptability and the factors that can facilitate the building of adaptive expertise.

Training design

Research has focused on learning principles and instructional events that can be incorporated into a plan of instruction and guide training design (e.g., Gagné, Briggs, & Wager, 1993). There are emerging research areas in cognitive and instructional psychology that hold promise for improving training design for more adaptive and effective training transfer. These include the incorporation of guided discovery learning, the incorporation of error-based instruction, and the training of metacognitive skills (for a more complete review, see Smith, Ford, & Kozlowski, in press).

Traditional learning approaches explicitly instruct trainees on the complete task to be learned in terms of concepts, rules, and task strategies. This deductive approach is in contrast to recent efforts on guided discovery which takes an inductive approach to learning. With guided discovery, trainees explore and experiment with the training tasks to infer and learn the rules, principles, and strategies for effective performance. Guidance can come in the form of providing the learner with leading questions or in providing prompts without giving solutions (Kamouri, Kamouri, & Smith, 1986). Guided discovery can lead to greater transfer due to increased trainee motivation to learn since trainees are actively engaged in the learning process. Guided discovery also encourages the use of hypothesis-testing and problem solving strategies which require more conscious atten-

tion for their application (Veenman, Elshout, & Busato, 1994), and greater integration of trained material to the trainees previous experiences (Frese & Zapf, 1994).

A second design strategy is error-based learning (Ivancic & Hesketh, 1996). While most training approaches seek to minimize incorrect responses, recent research has argued that learning environments designed to be error-filled experiences can be quite effective for learning and transfer. Errors obviously get the learner's attention and alert them to incorrect assumptions. In this way, making mistakes can lead to a better "mental model" of the task to be learned. Frese and Altmann (1989) have identified methods to assist trainees in managing errors. The instruction focuses on the beneficial aspects of errors for learning and the information that errors can provide. Based on this reasoning, Ivancic and Hesketh (1996) raise the possibility of training individuals by highlighting the errors they are likely to commit in training and provide examples of how to utilize this information to improve learning. A third new design strategy is to train metacognitive skills. Metacognition is the awareness and control of one's own cognition and learning strategies (Nelson & Narens, 1990). Metacognition is an executive level cognitive function that includes an understanding of relationships between learning tasks and individual capabilities as well as a control function of planning, monitoring, and regulating learning strategies. Research has provided evidence that incorporating metacognitive activities into instruction can facilitate learning (Veenman et. al., 1994). For

example, Volet (1991) found that undergraduate students taught metacognitive skills, received better grades in a computer course and were better at applying this knowledge to solving new problems than a control group.

Thus, there are new, exciting strategies for improving training design and enhancing learning and transfer. Future research is needed that applies these concepts to organizational training programs and processes.

Trainee characteristics

Our updated review showed improvement in the use of theoretical perspectives to guide the choice of trainee characteristics. In particular, there has been more focus on motivational factors and their impact on learning and transfer. Two directions for future research are the

examination of learner goal orientation as well as the impact that previous experiences may have on an individual's motivation to learn and transfer trained skills to the job.

Researchers have recognized that learners differ in what they do during learning and in their capability to succeed in particular types of learning environments (Snow, 1989). One construct that is emerging from basic

to applied research areas such as training is the goal orientation of the learner. Two types of goal orientations have been identified. A mastery orientation includes the belief that effort leads to improved training outcomes. Individuals with a mastery orientation are focused on developing new skills, attempting to understand their learning tasks, and determining the

most appropriate learning strategies. In contrast, individuals with a performance orientation believe that ability is demonstrated by performing better than others and thus place efforts into doing well on a task regardless of whether they have acquired all the skills needed to generalize the skills to other settings. Research in classroom settings have found that emphasizing mastery goals can lead students to

In transfer research, there are two key situations or environments that a person works within; the training environment and the transfer environment. Individual characteristics of the trainee and training design can impact knowledge and skill acquisition.

use more effective learning strategies, to prefer challenging tasks, to have a more positive attitude towards the class, to be more persistent in the face of learning difficulties and to have a stronger belief that success follows effort (e.g., see Ames, 1992). Research is needed to apply these ideas to training situations so that interventions can be developed that support a mastery orientation and

hence enhance the potential for transfer to the job setting.

In addition to goal orientation, the construct of experience has much potential as an important trainee characteristic affecting learning and transfer. The selection literature has done an effective job of determining biodata items that define a person's previous experience and are related to future performance. The use of biodata as a strategy is based on the assumption that past behaviors and experiences of the individual act to shape future behavior and performance. Owens and Schoenfeldt (1979) have reviewed this literature and presented twenty-six dimensions of experiences such as academic achievement, intellectual/cultural pursuits, professional skills, and social leadership.

The biodata and work experience literature shows that a person's experience is multifaceted and complex. Yet, in the training literature, previous experience levels are rarely examined. Studies that do examine experience use job tenure as the measure of work experience. As noted by Quinones, Ford, and Teachout (1995) tenure is not an adequate measure of the amount and quality of experiences a person obtains within a given tenure level. Research is needed that uses existing typologies of work experience to examine the impact of previous experiences on trainee motivation to learn, learning, and transfer. A good example of this type of analysis is provided by Smith-Jentsch et al. (1996). They examined relative past experiences for their impact on training success. They found that pilots who had experienced safety problems were more likely to display greater levels of

assertiveness as a function of assertiveness training.

Work environment

Our review indicates that research has done a better job of identifying the multidimensional nature of key work environment constructs such as support, climate, and opportunity. The traditional research on climate and support (e.g., Schneider, 1987) highlights the complex interactions of the individual within a particular environment. Interactional psychology has long emphasized this continuous, multidirectional interaction between person and situational characteristics (e.g., see Terborg, 1981). This perspective contends that characteristics of the people and of situations jointly determine individual attitudes, cognitions, and behaviors.

In transfer research, there are two key situations or environments that a person works within—the training environment and the transfer environment. Individual characteristics of the trainee and training design can impact knowledge and skill acquisition. The characteristics of the trainee and the transfer environment then interact to impact the application of the knowledge and skills brought to the job. While an interactionist perspective is often discussed in the training literature, few research studies have systematically examined their impact on transfer. Most of the studies in our review either only looked at one set of factors (trainee characteristics, design, work environment) or examined the impact of multiple sets of factors as if the factors were independent of one another. One study by Tesluk, Farr, Mathieu, and Vance

(1995) examined the impact of attitudes towards employee involvement and the extent to which there was a participative climate as perceived at the group/unit level and the larger suborganizational/functional level.

Future research needs to focus more attention to which person and situational factors may interact to affect learning and transfer. For example, an individual that is high on the trait of openness to new experiences might learn and transfer more from a guided discovery or inductive training program than an individual who has a high need for order or low tolerance for ambiguity. Or, mastery oriented individuals may be more likely to try newly trained skills regardless of the transfer climate of the organization while a performance oriented individual would look towards the climate for cues as to whether he/she should attempt to learn and transfer trained skills.

Transfer effects can also be examined at the department/team level and the organizational level as well as the individual training program level (Kozlowski & Salas, 1997; Ostroff & Ford, 1989). For example, some units within an organization such as research and development focus on long-range problems where feedback about success is long-delayed. Sales and production units, on the other hand, deal with more short-term problems that provide rapid feedback. Thus, one could reasonably expect differences in support and climate across these units relevant to interpersonal skills training that does not have a direct relationship to the bottom line. Thus, greater training transfer for the interpersonal skills might be

found in the research and development unit.

In addition, many organizations are striving to become continuous learning organizations. With a continuous learning philosophy, learning is considered an everyday activity for all employees with training as a key mechanism for improving basic literacy skills, technical skills, and interpersonal skills (Noe & Ford, 1992). The process of becoming a continuous learning organization can be quite lengthy as it calls into question core organizational assumptions, practices, and procedures. To detect organizational level effects on training transfer, one would need to compare across organizations which differ in the extent to which they ascribe to a continuous learning orientation. Thus, research is needed that explores transfer not only from an individual program perspective, but also from a departmental and organizational perspective.

Conclusions

This updated review and analysis has focused on twenty studies that have examined transfer since the original review conducted by Baldwin and Ford (1988). Although not as comprehensive in scope as the original review, our analysis of the recent research shows much progress relative to the key limitations noted in the previous review. There is greater sensitivity to the need for criterion measures of transfer beyond self-reports, more conceptual frameworks to drive the choice of trainee characteristics, the use of more complex learning tasks that more closely mirror the learning tasks found in work settings, and the development of more sophisticated theoretical and operational

measures of key work environmental factors such as transfer climate. We then cite a number of emerging issues that hold great potential for further advancing our understanding of training transfer. These issues include a new perspective for conceptualizing transfer as adaptability, the use of new design strategies for enhancing transfer, the identification of trainee constructs, and a push for more research examining the person within situations. We hope that ten years from now, progress in these areas will be evident by the transfer issues that are being addressed and the type of research that has been completed.

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