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Transfer of Training: The Known and the Unknown

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Abstract

Transfer of training is one of the oldest topics of interest to industrial and organizational (I/O) psychologists. Drawing on several meta-analytic studies and recent empirical work, we first synthesize what is now reliably known with respect to the generalization and retention of learned knowledge and skills to work contexts. The second part of our review focuses on what is unknown—the significant gaps in our knowledge where we believe new directions in our research strategies are warranted. We offer three prescriptions: (*a*) going one step beyond most existing studies to offer greater precision in our specification and measurement of variables and interventions, (*b*) connecting the dots by focusing on transfer criteria and transfer trajectories, and (*c*) shifting the operative paradigm of research to examine contemporary learning from a problem-centered perspective. There is ample opportunity to increase the yield on enormous organizational investments in training if transfer scholars and practitioners are fully informed of what is known and prepared to systematically confront the unknown in new and innovative ways.

INTRODUCTION

On the basis of the belief that training and development enhance organizational competitiveness, businesses are making ever-increasing investments in the training of their workforces (Ho 2016). A growing body of research has found that training investments are related to a variety of important firm outcomes and can contribute substantively to competitive advantage (Birdi et al. 2008, Kim & Ployhart 2014, Salas et al. 2012, Sung & Choi 2014). For example, Kim & Ployhart (2014) examined 359 firms over 12 years and found that the amount of internal training investment over time was significantly related to firm profit growth via the impact of that training on labor productivity.

Despite the intuitive and evidentiary support that training is a "good" thing for organizations, the reality is that there is far less consensus regarding the effectiveness of training at the individual initiative level. Positive transfer of training—the extent to which the learning that results from a training experience transfers to the job and leads to meaningful changes in work performance—is generally regarded as the vehicle by which training leads to organizational outcomes (Goldstein & Ford 2002). However, researchers and practitioners continue to question how much learning from individual training initiatives is typically transferred to the job (Beer et al. 2016, Brinkerhoff & Montesino 1995, Chiaburu et al. 2010b, Ford et al. 2011, Grossman & Salas 2011). For example, outcomes for individual leadership training programs are often disappointing or elusive (Conger 2004). This paradox—training investment at the organizational level of analysis is viewed so positively, whereas individual training initiatives are viewed so skeptically—was a primary impetus for this review.

The purpose of this review is twofold. First, given the substantial volume of transfer research undertaken over the past decades since Baldwin & Ford's (1988) initial review—including recent meta-analytic studies—we first synthesize what we reliably know. Our goal is not to be exhaustive, but rather to highlight areas where consensus has formed (primarily via meta-analyses) and to acknowledge advances that are of relevance to scholars and learning professionals. As Baldwin & Ford (1988) note, the usefulness of the empirical research on transfer is deeply impacted by the quality of the criterion measures. Therefore, we organize our review around the two key conditions of transfer: the (*a*) generalization of knowledge, skills, and behaviors learned in training and the (*b*) maintenance or retention of that learning over a specified period of time. Several advances in our understanding and measurement of those two constructs have appeared in the recent literature.

Second, we highlight areas where our gaps in knowledge remain acute and where key shifts in our research strategies are warranted. There is potential for a much greater yield on the enormous organizational investments in training—but only if researchers are conducting the types of studies and synthesizing the knowledge learned in ways that stimulate thinking about transfer and ultimately are meaningful to professionals (Baldwin et al. 2017). We conclude with some thoughts on training in contemporary organizations and implications for more impactful future transfer research.

We organize the review into three sections. We first present an updated integrative empirically based review of what we now know about the factors impacting transfer criterion constructs of generalization and retention through a targeted focus on meta-analytic findings and select individual studies. Second, we examine what we know about the impact of specific interventions to enhance transfer pre, during, and post training. Third, we provide a research agenda to expand the scope of what we study as well as shift our paradigm to improve our understanding of training transfer and ways to enhance transfer over time.

FACTORS AFFECTING TRANSFER OUTCOMES

Effective transfer has proven to be a complex and often elusive outcome, so isolating the individual and contextual factors that influence or impede transfer is an important part of any major training implementation. We first focus on research examining generalization and then turn to research on maintenance and retention/skill decay outcomes.

Factors Impacting Generalization

Generalization involves more than mere mimicking of responses to events that occurred in training by focusing on the extent to which trainees exhibit new behaviors on the job in response to settings, people, and situations that differ from those presented during training. For example, a salesperson might be trained on how to be assertive but not aggressive in conducting a sales meeting with a client. The situations, issues, and types of clients that can be simulated in the training program cannot match the range of situations or the diversity in clients faced on the job. Thus, key principles and skills from training must then be applied by the trainee in the appropriate way with a diverse range of settings and people.

Blume et al. (2010) conducted a comprehensive meta-analysis of factors impacting generalization as measured by use of trained knowledge and skills on the job and the effectiveness of that use. They studied the strength of relationships between these two transfer outcomes and trainee characteristics and work environment factors. They also examined possible moderators such as the type of transfer measured (use or effectiveness), the timing of measurement, self- versus other mea- surement, and open or closed skills for their influence on predictor–transfer relationships. They also examined estimates of same-source (SS) and same-measurement-context (SMC) effects.

The meta-analysis included 89 studies with a median length of training of 6 hours and the median time for the transfer measure taken after training (for field studies) of 14 weeks. In regards to individual characteristics, they found small to moderate relationships with transfer for cognitive ability, conscientiousness, neuroticism, pretraining self-efficacy, learning goal orientation, and motivation. In terms of context, work climate had the highest relationship with transfer followed by support and then work constraints. Supervisory support had a stronger impact on transfer than peer support. Blume et al. (2010) also found that SS/SMC bias consistently inflated the relationships between the predictor and criterion constructs being investigated. The pattern of findings is consistent with the well-documented effects of common method variance (Podsakoff et al. 2003). For example, the relationship of work environment (support) and transfer was 0.54 with studies that had SS/SMC bias and 0.23 in studies without these effects.

Moderator analyses (without SS/SMC bias) found that motivation had a stronger relation- ship with the transfer measure of use than effectiveness but similar relationships were found for knowledge and work environment factors. The strength of the predictor-criterion relationships of individual characteristics or contextual factors on use and effectiveness was higher for open as opposed to for closed skills (Yelon & Ford 1999). For example, the relationship was 0.23 for pretraining self-efficacy and transfer for open skills (with a 95% confidence interval ranging from .10 to .29) but 0.10 for closed skills (with a 95% confidence interval ranging from −.08 to .24). Similarly, for the work environment to transfer outcomes, there was a correlation of 0.26 for open skills (with a 95% confidence interval ranging from .15 to .29) and 0.10 for closed skills (with a 95% confidence interval ranging from −.07 to .13). Only two field studies examined multiple measures of transfer from the same source—both had strong correlations.

We examined empirical studies on transfer since the Blume et al. (2010) meta-analysis to determine if there were new or surprising findings or if there might be additional weight to the findings from the meta-analysis. In terms of individual difference factors, Huang & Ford (2012)

examined state locus of control and found that changes in locus of control attributions (that accidents are more a function of internal controllable factors) due to safety training predicted safe driving behaviors of truck drivers. Similarly, Huang & Bramble (2016) examined the role of trait and state in a learner-controlled computer-based training program. They found that task-contingent conscientiousness had a direct effect on training transfer when the task demands were difficult and dynamic. These studies add to Blume et al.'s (2010) meta-analysis as they focus on state rather than just trait measures of key constructs and show how learning states can impact transfer.

For context factors, several studies continue to find that workplace support is an important factor. The main advance is the measurement of support and/or transfer at more than one point in time. For example, Franke & Felfe (2012) found that a measure of support gathered immediately after a leadership skills training program was correlated with self-reported behaviors one year after training. Thus, although we have found several studies conducted on support (not reported here) since Blume et al.'s (2010) meta-analysis, there is not much new to be gained on the fundamental, but nonspecific, finding that workplace support is important. One promising new direction for transfer research can be found in work by Schindler & Burkholder (2016), who conceptualized and measured support as a multidimensional construct including dimensions of mentoring, coaching, social support, and task support. We discuss more extensively the importance of greater precision in defining workplace contextual factors in our future research directions section.

An encouraging advance since 2010 has been a focus on the transfer construct and its measurement. Bozer et al. (2014) evaluated the success of coaching training by investigating how well the individuals being coached improved in their performance as reflected in supervisory ratings. Huang et al. (2015) used a meta-analytic correlation matrix and modeled relationship to study how findings of transfer research differ depending on whether the transfer measure focuses on maximal (a role play) or typical transfer (performance ratings). Maximum and typical transfer were only weakly correlated and predicted by different antecedents (e.g., ability factors were stronger predictors of maximum transfer, whereas motivation factors were stronger predictors of typical transfer). Chiaburu et al. (2010a) showed the potential for biases in self-report training transfer ratings particularly when trainees are high on conscientiousness or when the trained skills are low in visibility to supervisors who are asked to give transfer ratings.

Factors Impacting Retention/Decay

Maintenance and retention 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. Decreases in the use of trained skills on the job could be a result of skill decay due to inadequate opportunity to exhibit the knowledge, skills, or trained behaviors on the job or a decreased motivation to use the skills due to constraints or lack of rewards (Ford et al. 1992). One could also hypothesize a positive cycle of increasing use and effectiveness of trained behaviors as an individual obtains opportunities to use the skills to enhance their capabilities (Baldwin & Ford 1988).

Retention research has mainly focused on the individual task level, examining the declarative or procedural knowledge and/or proficiency level of psychomotor or behavioral (procedural) skills. The typical study of retention tests individuals immediately after training to gauge proficiency levels of knowledge and/or skills and then evaluates individuals with the same measures of proficiency after some period of time of nonuse. Research has also focused on factors that impact the amount or percent of decay of skills over time including task-based factors (e.g., task complexity/difficulty), training-related factors (e.g., spaced versus massed practice, amount of training), and individual differences (e.g., cognitive ability and personality factors).

Hagman & Rose (1983) reviewed 13 studies conducted or sponsored by the military on retention of military skill-based (psychomotor) tasks performed in an operational (transfer) environment. The key findings across studies for time to complete the task and/or number of errors committed was that enhanced retention was achieved by (*a*) increasing the amount of task repetitions, (*b*) testing during training, (*c*) spaced practice, and (*d*) incorporating variety of equipment worked on during training. Two task factors found to be relevant for understanding retention were the number of steps to complete the task (one dimension of task complexity; Wood 1986), and the presence or absence of sequential cues. They also found that cognitive ability predicted the level of proficiency at the acquisition/learning stage but that the rate of forgetting over time was similar for individuals with high and those with low cognitive ability.

Driskell et al. (1992) conducted a meta-analysis of 15 studies with 88 data points to investigate the impact of overlearning (task repetition) on retention. They found that overlearning had a modest impact on retention and that the effect was moderated by the degree of overlearning (more repetition is better for retention), the type of task (overlearning was effective for both physical and cognitive-based tasks with the effect somewhat stronger for cognitive tasks), and the length of the retention interval (i.e., retention decreased especially for cognitive-based tasks). Arthur et al. (1998) conducted a broader meta-analytic study with 189 independent data points extracted from 53 studies. They found significant skill loss with nonuse or nonpractice. Similar to Driskell et al., they found that cognitive tasks were more susceptible to decay than physical tasks. They also found differences for closed versus open tasks (Yelon & Ford 1999) with higher levels of retention for closed-looped tasks. Similar conditions of retrieval during the acquisition and retention phases also led to less skill loss over time. They found that using recognition measures of knowledge led to findings of less retention loss than using recall measures. Moreover, using accuracy-based measures (errors committed) led to findings of greater decay than when using speed (time to completion) measures. These findings highlight the important, although too often ignored, role that the criterion chosen can have on results found.

In their more recent meta-analytic study, Wang et al. (2013) reported similar (although effect sizes were lower) findings on decay, with more decay the longer the retention interval and with decay more likely for procedural than for declarative knowledge. The researchers also found that retention-enhancing interventions post training lead to less decay.

INTERVENTIONS TO ENHANCE TRANSFER

Specific strategies for enhancing training transfer have been suggested for before, during, and after a training initiative (Burke 2001). In this section, we focus on interventions that have been studied for their impact on transfer rather than end-of-training learning measures. We conclude with a discussion of recent work on team training interventions and transfer.

Pre- and Post-Training Interventions

Prior to training, one must consider both the job context and the individual's need for training because trainees often have already formed intentions to apply or not apply the training that they will be receiving (Yelon et al. 2004). Although this research highlights the potential importance of pretraining interventions, Blume et al. (2010) found only three studies on pretraining interventions—all targeting the provision of realistic training previews. These studies showed a small overall impact for providing realistic previews of the upcoming training on transfer outcomes. Unfortunately, since the Blume et al. (2010) meta-analysis, we could find only one additional empirical study examining pretraining interventions. Weissbein et al. (2011) created an intervention to affect state

locus of control prior to a negotiation training program. They found that the pretraining intervention impacted the trainee's internal, controllable attributions, which in turn affected the trainee's motivation to learn. Motivation impacted the amount of practice and rehearsal activities engaged in prior to the transfer negotiation task. This area is ripe for more research looking at not only how the training is framed for trainees before training but also interventions, such as orientation sessions for supervisors so they can support individuals who attend the training and pretraining preparatory assignments. For example, although not a study of transfer per se, Towler et al.'s (2014) showed that leaders who exhibited discretionary behaviors consistent with an upcoming training program created a climate in which trainees placed greater importance on learning during the training. In addition, much of the research has focused on either pretraining or post-training interventions. Research is needed that demonstrates that aligning pre- and post-training interventions (e.g., supervisory orientation sessions on what is being trained along with post-training sessions on how to support that training) can impact transfer outcomes (Baldwin et al. 2017).

With respect to post-training interventions, Blume et al. (2010) found a relatively small number of empirical studies. Findings from the meta-analysis revealed that the impact of post-training goal-setting interventions on transfer was modest and that there was no overall impact of relapse prevention interventions on transfer outcomes. Since then, T.C. Brown and his colleagues have conducted a series of studies on goal setting and transfer outcomes as measured through multisource behavioral observation scale ratings. Results indicated that, counter to expectations, do-your-best goals were as effective in facilitating transfer as were various types of other goals (outcome-based goals, specific behavioral goals; Brown et al. 2013, 2016). Brown & Warren (2009) found no significant differences between distal and more proximally set goals. Johnson et al. (2012) investigated a five-day leadership development program with multisource survey transfer data and found that specific behavioral goals led to perceived improvements in competencies for two of the three skill components. Moreover, those who set more than one transfer goal were perceived as having improved more on the competencies than those who set just one goal.

One new promising post-training approach, examined by Shantz & Latham (2012) with a sample of training IT professionals, involved selection-interviewing techniques where the experimental condition incorporated written self-guidance. Trainees wrote post-training letters to themselves about which components of the training were most important with regard to self-affirmation. Prior to a later mock performance interview, the trainees in the self-guidance condition reread their letters. Results indicated that the self-guidance group had significantly higher ratings on the interview ratings than those in the control group.

Training Design, Method, and Delivery

Several meta-analytic studies and qualitative reviews have been completed on factors impacting transfer (generalization or retention), including a focus on singular design elements (e.g., distribution of practice), training method (e.g., error management), and various design elements within a specific delivery mode (e.g., simulation training programs). Donovan & Radosevich (1999) examined 63 studies and 112 effect sizes and found a strong distribution of practice effects wherein spaced practice conditions consistently led to greater transfer (retention performance defined as performance separated from the practice conditions by at least one day's time) than massed practice conditions. The effects for spaced practice were stronger for more closed- than open-skill tasks.

With respect to training methods, Taylor et al. (2005) investigated the effect of behavioral modeling training (learning points, modeling, role playing, feedback) against a no-training comparison. The analysis of 119 studies and 279 effect sizes showed three main findings of factors impacting transfer (measured as job behavior): (*a*) the use of mixed models (positive and negative

models during training) as opposed to only positive models for more effective modeling; (*b*) the generation of learning points by trainees; and (*c*) the training of not only trainees but supervisors as well, and incorporation of supervisory rewards in the job context. The latter findings suggest the utility of signaling the importance of training to trainees (Towler et al. 2014) as well as enhancing accountability once back on the job. Keith & Frese (2008) identified 24 studies (mostly using software training as the learning stimulus) investigating the error management training method (often compared to procedural training) and found a positive impact on as well as stronger effects of error management training for adaptive transfer tasks (where performance tasks were different than the training tasks) in comparison to more routine transfer. This suggests that error management strategies are particularly useful for more open skills than for closed skills. In addition, within-training learning measures did not show an effect for error management training—again highlighting the critical importance of getting beyond the training time period to collect transfer data that more definitively reveal training effectiveness.

Cook et al. (2013) examined the effectiveness of design elements in simulation-based medical training programs. The 289 studies (208 with randomized trials) located examined design factors impacting knowledge and skill outcomes as well as behavioral outcomes (including patient effects). Although only a small number of studies collected behavioral data, the key factor predicting behavioral outcomes was the incorporation of multiple learning strategies (case analysis, worked examples, discussion) during training. None of the other design elements examined (e.g., interactivity, difficulty) significantly predicted transfer.

In addition to the meta-analytic work, extensive research in cognitive science and educational psychology has led to integrative reviews of those instructional strategies that have been found effective in enhancing retention of learned material. In particular, Roediger & Butler (2011) drew conclusions regarding design factors most conducive to generalizing learning from one context to another. They concluded that retrieval practice (e.g., completing tests), which leads to active repetition of learning, helps promote transfer of learning. Dunlosky et al. (2013) summarize several studies and conclude that the factors most likely to affect transfer outcomes (e.g., handling abstract transfer problems) include the use of concurrent self-explanation during the learning phase, distributed practice, and interleaved (alternating practice on different kinds of problems) practice. Block practice has been shown to lead to better performance immediately following training, but interleaved practice has been found to lead to better transfer retention. Brown et al. (2014) also present evidence that enhancing difficulty during the learning phase leads to enhanced retention. These research findings across multiple studies show the promise of incorporating intentional design strategies into workplace training programs. Key questions remain, however, regarding the types of strategies that are most effective given different types of training programs and different types of training contexts.

Team Training

Although most transfer studies have been at the individual level of analysis, a promising stream of work has begun to look at the impact of team training on transfer outcomes. In a meta-analytic review of seven studies and 28 effect sizes, Salas et al. (2007) demonstrated that team coordination and adaptation training generally produced better outcomes than cross-training or guided team self-correction. Results were consistent for both supervisory ratings and objective productivity measures. Two other meta-analyses have been conducted that examine the effectiveness of crew resource management training, a training stimulus that seeks optimal resource use by team members. In both aviation and health-care settings, this training strategy was found to lead to more effective team performance as measured by observer ratings (O'Connor et al. 2008, O'Dea et al. 2014).

Several recent empirical examples highlight key advances in the study of team training and its impact on transfer in a health care context. Vashdi et al. (2013) implemented reflexivity training among surgical teams involving use of briefs and debriefs, interventions which ultimately led to increased team helping, workload sharing, and in turn shorter surgery durations. Furthermore, Sonesh et al. (2015) examined the effects of a teamwork training intervention among obstetrics teams, finding that participating in training led to greater decision-making accuracy and shorter hospital stays for infants under care. Examining a teamwork training intervention focused on safety culture, Jones et al. (2013) found that application of teamwork skills as well as changes in perceptions of safety culture were dependent on support from supervisors. In a recent meta-analysis of health care studies, Hughes et al. (2016) found evidence for the effectiveness of team training on both organizational and patient-health outcomes. Of note, Hughes et al. (2016) examined measures of team affect, cognition, teamwork skill (e.g., coordination), clinical task performance, and prevalence of medical errors, all assessed at least one day after the training program. All measures except for the cognitive ones demonstrated significant improvements due to team training. The number of learning strategies, incorporation of feedback, level of fidelity, and resource demands of patients served did not moderate the relationship between team training and transfer outcomes.

Outside of the health care context, recent work has also examined interventions that promote team coordination. Gorman et al. (2010) investigated perturbation training, which involves forcing teams to adapt to the removal of normal coordination means. The researchers found that the training led to higher simulated flight performance than did cross-training or procedural training. Rentsch et al. (2010) showed that training teams that used a shared knowledge tool (in this case an information board) led to improved knowledge sharing and a higher quality team action plan. Dierdorff & Ellington (2012) showed how goal orientation at the team level could influence individual-level self-efficacy and engagement in metacognition. These researchers also found that the development of team self-efficacy and metacognition was related to team strategic decision making. Other work has shown how team-specific skills (e.g., helping behaviors, workload sharing) are linked to objective indicators of transfer (Vashdi et al. 2013). These empirical examples demonstrate creative use of objective measures of team performance to investigate the effectiveness of teamwork strategies. Nevertheless, research efforts that more clearly link team learning outcomes such as coordination and shared mental models (Bell et al. 2012) to transfer outcomes are clearly needed.

A Summary of What We Know

Transfer of learning is among the oldest questions addressed by industrial and organizational (I/O) psychologists (Bell et al. 2017). In 1988, the first two authors undertook a qualitative review to synthesize a fragmented body of empirical research reported in a variety of disciplines (Baldwin & Ford 1988). We specified the conditions of transfer as the generalization of knowledge and skills to the job and the maintenance and enhancement of that initial learning over time. Our organizing framework consisted of the categories of trainee characteristics, training design, the work environment, and learning/acquisition during training.

We ultimately uncovered 63 empirical studies spanning the period of 1907–1987. The vast majority of empirical studies focused on design (learning principles such as variability and over-learning). A very few others had begun to explore person factors such as motivation to learn and impacts of post-training contextual factors such as workplace climate. The transfer criteria used were largely closely proximate to the learning event and generally self-reported. Most studies involved simple motor or memory tasks as the learning stimulus. Indeed, among our closing comments of that review was that "...conclusions from the existing research are problematic given the

relatively short-term, single source perceptual data base that has been created. A variety of factors and linkages have not yet been examined . . ." (Baldwin & Ford 1988, p. 100).

Since that call to arms more than 30 years ago, it has been gratifying to see an explosion of empirical research on training transfer (Kraiger & Aguinis 2001). Researchers have expanded investigation beyond training design to include pretraining influences and post-training contextual factors, and our understanding of generalization and retention is now significantly advanced. Although it is often lamented that the research literature offers too little to practitioners, the reality is that much has been learned over the past few decades that does offer prescriptive counsel. Although a comprehensive accounting of all practical counsel is beyond the scope of this review, in **Table 1**, we provide a concise synthesis, organized by person, design, and work environment dimensions, of some of the more impactful prescriptions that can be derived from the extant research evidence.

FUTURE RESEARCH OPPORTUNITIES

The review (and **Table 1**) highlights areas where some consensus has been obtained based on several empirical studies and synthesized through various meta-analytic studies. For example, there is no need for additional studies to determine if supervisor (or peer) support is important for facilitating training transfer. Leader or peer support has been found to be important in studies spanning a variety of countries with different cultural characteristics and settings. Rather, it is important to expand or "go one step beyond" the predictor-outcome relationships that are now well established.

In addition, Blume et al. (2010) noted that the average time after training of transfer measurement was 14 weeks and most studies correlated pretraining or immediate post-training factors with the transfer measure of use or effectiveness. But we know that much happens to the individual trainee from the time they leave training to when we measure transfer—however, we too rarely have investigated what happens during that interval. We contend that it is time to go further and "connect the dots" as to what changes are occurring for individuals as they begin to have work experiences relevant to what was trained and how those experiences affect factors such as motivation to transfer.

Finally, we argue that there is a need to shift our paradigm to better fit the changes that are occurring in organizations relevant to learning such as an increased emphasis on autonomous learning in the workplace (Ellingson & Noe 2017). Below we elaborate on each of those three new directions of going one step beyond, connecting the dots, and shifting the paradigm. **Table 2** presents a set of research questions that flow from our discussion.

Going One Step Beyond

Transfer research has traditionally focused on examining singular training programs at the individual level and the factors that might enhance or inhibit transfer in that setting. Now it is time to move one step beyond to extend that general knowledge base. More specifically, we prescribe going a step beyond in two particular areas: (*a*) investigating workgroup support as a multidimensional construct and (*b*) creating post-training interventions that have the potential to have larger impacts on transfer than we currently have found.

Examining support as a multidimensional construct. Meta-analytic findings show unequivocally that support is important to transfer (e.g., Blume et al. 2010, Colquitt et al. 2000). However, what aspects of support and why and when they are most helpful are more difficult questions to

Table 1 What we know about training transfer

Stage	Factors impacting transfer	Implications
Personal characteristics	**Overall**	**Expect individual differences and design with that in mind.**
	Personality and ability	Cognitive ability and conscientiousness have the strongest relationships to transfer.
	Learning states	Frame training to enhance learning states such as mastery orientation.
	Motivation	Motivation to learn is particularly important when training open skills.
	Efficacy	Pretraining self-efficacy is particularly important when training open skills. Enhance self-efficacy during training through demonstration and practice. Post-training self-efficacy is particularly important for effective transfer for interpersonal/leadership training.
Training design and implementation	**Overall**	**Incorporate well-known learning principles into training design.**
	Learning strategies	Employ multiple learning strategies (case analysis, worked examples, discussion) during training.
	Demonstration	Use mixed models (positive and negative models during training) rather than only positive models.
	Errors	Incorporate error management strategies during training especially for open skills.
	Design	Space or distribute practice and incorporate difficulty into the learning tasks.
	Retrieval	Have multiple retrieval practice opportunities (e.g., completing tests) to allow for active repetition of learning.
	Goals	Have trainees set concrete transfer goals by the end of training.
Work environment	**Overall**	**Invest heavily in efforts to facilitate transfer.**
	Supervisor and peer support	Provide ways for leaders and peers to support trainees on the job. Hold supervisors accountable for application of key training knowledge and skills. The extent of workgroup support is particularly important when training open skills.
	Opportunity to perform	Provide opportunities to apply trained skills immediately on the job.
Transfer measurement	**Overall**	**Follow trainees after training to find out what has worked and what has not worked to aid in redesign and continuous improvement of the training.**
		The measurement of transfer (use or effectiveness) can lead to different conclusions about the effectiveness of training. Beware of interpreting results of factors impacting transfer if all the measurements are from a single source.

answer, given recent qualitative work showing that support may take distinct forms (Lancaster et al. 2013, Lancaster & Di Milia 2014).

Although the source of support may vary (e.g., peer, supervisor), research of social support from other disciplines serves as a good starting point for identifying support dimensions. Research findings suggest that support can be thought of in terms of three dimensions (Broadhead et al. 1989, Krause & Markides 1990, Sherbourne & Stewart 1991, Stansfeld & Marmot 1992).

Table 2   Research agenda for training transfer

Future agenda	Targeted focus	Research questions
Going one step beyond: Greater precision in specifying variables and interventions	Taking a multidimensional perspective to workplace support	Which type of support is needed early in the transfer setting? What individual differences moderate the impact of support dimensions on transfer rates? How do different types of support impact transfer trajectories?
	A renewed emphasis on interventions to enhance transfer	When and for what type of programs are implementation intentions more effective? How effective are after-action reviews around early-transfer experiences?
Connecting the dots: Emphasis on transfer as an episode with a trajectory over time	Examining what happens between acquisition in training and our measurement of transfer	How does the success/failure of initial applications of trained material impact transfer trajectories? What self-regulatory strategies do trainees engage in and how do these regulatory strategies impact transfer?
	Investigating how individual skill decay in taskwork and teamwork skills relates to team performance	How do the determinants of maintenance/retention curves differ at the task and team level? How does individual skill decay impact team performance? During a decay period, what unique processes exist at the team level that may buffer or accelerate decay?
Shifting the paradigm: Emphasis on contemporary learning and authentic contexts	Research consistent with how learning is occurring in organizations today and into the future	As learning becomes more on-demand, what factors become more relevant for enhancing transfer? How can technology be used effectively to enhance the generalization and maintenance of linked learning events?
	Personalization/ individualization of transfer	What novel approaches are suited to capturing individual training needs? What factors impact decisions to immediately attempt to transfer a new knowledge or skill? How do changes in efficacy, motivation, and learning states impact transfer trajectories over time?
	Taking a problem-centered approach to the study of transfer	What are effective combinations of pre-, during-, and post-training interventions? How do time-to-proficiency criteria align with current transfer constructs of use and effectiveness?

Affective support refers to encouragement or acting in a way to promote positive affect. Informational support involves providing guidance or advice. Finally, instrumental support describes the provision of resources or direct behavioral assistance. Understanding the importance of these dimensions requires expansion of a key meta-analytic finding by Colquitt et al. (2000) that support promotes transfer primarily through motivation. Kanfer (1990) identified three processes that underlie an individual's overall motivation to engage in a specific behavior including direction (the chosen goals or activities to pursue), vigor (the expense of effort), and persistence (the investment of sufficient time).

Several examples of the value of a multidimensional perspective on relationships between support, motivation, and transfer have been reported. For example, Blume et al. (2010) found that support had a stronger relationship with the transfer of open skills than closed skills. The type of training may promote the utility of support dimensions differentially, with open skills placing greater directional demands on an individual that are best met with informational support. Cultures

high in power distance (House et al. 2002) may make affective support from a supervisor appear abnormal to a trainee suffering from declining vigor. Finally, the timing of support may vary with fluctuations in the processes underlying motivation. Trainees at a novice level may need more informational and instrumental support to gain the right direction and persist long enough to express a behavior. As time goes on, those trainees may benefit most from affective support to maintain adequate vigor. A multidimensional view of support and its relation to trainee motivation and behavior over time can serve as a useful framework for guiding future research.

Expanding what interventions we investigate. Although empirical research on post-training interventions is sparse, there is convincing evidence that specific interventions targeted to impact behavioral changes outside a training context are effective. One such intervention involves helping individuals translate their goals into action through setting implementation intentions. Implementation intentions make self-set goals more effective through focusing on helping individual trainees select the most effective behaviors to target, specify the desired outcomes, and detail what opportunities (and situational cues) will occur where the behavior can be exhibited. Meta-analytic findings show that implementation intentions have a major impact on subsequent goal achievement across a wide set of domains (Gollwitzer & Sheeran 2006). A recent study in the training domain by Friedman & Ronen (2015) investigated the effects of forming implementation intentions by visualizing (e.g., a future interaction with a customer) and writing down a detailed implementation plan. The field study of sales training found support for those with implementation intentions outperforming those in the control conditions using a mystery shopper to rate performance four weeks after training. We need more research that targets the type of training and contexts where implementation intentions will be most effective. In addition, research is needed that examines the impact of combining different types of interventions, such as having trainees form implementation intentions, as well as including a self-guidance intervention similar to that which Shantz & Latham (2012) proposed. Error-based training interventions combined with a post-training intervention such as self-guidance might be more impactful on transfer than error training alone.

Another approach found to impact both skill acquisition and performance improvements (but not yet training transfer) is the implementation of after-action reviews (AARs) or debriefs (Ellis & Davidi 2005). Debriefs allow individuals and/or teams to reflect on a particular event and uncover lessons learned to inform future actions in similar situations. Villado & Arthur (2013) investigated the effectiveness of AARs during training and found that they led to improved team communication, cohesiveness, and efficacy as well as enhanced learning (measured as team performance) during training. Tannenbaum & Cerasoli (2013) conducted a meta-analysis of 11 effect sizes from 46 independent samples and found that debriefs improved team (and individual) effectiveness by approximately 25%. Although the evidence in support of AARs is limited mostly to learning acquisition, this strategy certainly has relevance for enhancing training transfer. In particular, it would be useful to examine the impact of supervisors conducting such reviews after an individual has made initial attempts to apply some aspect or procedures from the training program. If done well, such a review process should also affect how much support the individual trainee feels is being provided by his/her supervisor.

Connecting the Dots

Beyond encouraging the study of less typical variables, there is also a pressing need to "connect the dots." Connecting the dots implies going into more depth in terms of the types of constructs studied than we typically see in transfer studies and more creativity in the conceptual frameworks

we create. This section focuses on three research directions: (*a*) expanding the criterion space that we focus on as researchers to better capture impact, (*b*) uncovering what happens between our typical measurement of transfer predictors and subsequent transfer outcomes, and (*c*) investigating how individual skill decay impacts team performance.

Expanding the criterion space. Some notable attempts have been made to expand and enhance our understanding of transfer criteria. One key approach by Gagne (1965) distinguished between lateral and vertical transfer. Lateral transfer is the idea that transferred skills can be used in a domain that is different from (although similar to) the one in which they were intended to be used, whereas vertical transfer refers to trained skills being used to build increasingly complicated skill sets. Unfortunately, relatively few studies have explored lateral and vertical transfer or the various antecedents of each.

Many transfer studies have measured use of the training to the job in order to measure the generalization of training. With respect to lateral transfer, Yelon et al.'s (2015) work suggests that motivated individuals who experience success in applying training (and those who overcome initial failures) are more likely to expand their use of the training beyond direct attempts to improve their own job performance—which calls for considering use as a multidimensional construct. They present evidence that trainees are able to describe training use well beyond just direct use even two to ten years after training—including extended activities such as seeking additional ways to apply the training (e.g., to nonwork situations); persuading other trainees to try out trained skills on the job; teaching others some key skills from training; and changing policies, procedures, or systems in the organization based on what was learned during training. These findings suggest that to understand what is occurring between our predictors and transfer outcomes requires capturing the expanding uses of training—outside of direct use—for a particular job task.

With regard to vertical transfer, research in educational and sports psychology has focused on the learner's experience and the relationship of those experiences to life skills transfer. Life skills transfer is defined as the "internal personal assets, characteristics, and skills such as goal setting, emotional control, self-esteem and hard work ethic that can be facilitated or developed in sport and transferred for use in nonsport settings" (Gould & Carson 2008, p. 60). Pierce et al. (2016) explore how sport provides a learning environment with demands, program design, and leadership influences (via coaches) that can help or hinder the transfer of teamwork, social skills, communication skills, and self-management skills. Training in sport may impact the building of complicated skill sets beyond physical skills through the internalization of a personal asset (e.g., psychosocial skills, disposition) that changes the person in contexts beyond where the skills were originally learned (Pierce et al. 2016). Similarly, Yelon & Ford (2016) conducted a case study investigating learning lessons used by four accomplished individuals over those experts' lifespans. The participants identified several lessons learned from conventional training programs and experiential learning that contributed to their level of life accomplishment, including industriousness, fastidiousness, integrity, communication, organization, and discipline.

The issues of lateral and vertical transfer fit within the larger taxonomy of transfer developed by Barnett & Ceci (2002). For example, based on one aspect of their taxonomy, the knowledge domain in the transfer setting can be very similar (near transfer) to the knowledge domain covered in training, or the domain can be quite different from the domain in training (far transfer). If we are to speak to and contribute to the larger domain of transfer research and not just the specifics of work transfer, we sorely need studies that investigate transfer across these different types and contexts informed by this taxonomy.

Finally, Kozlowski et al. (2001) noted the need to broaden the conceptualization of transfer outcomes to include adaptability to nonroutine situations. The researchers developed a multilevel

perspective to transfer outcomes to explicate the higher levels at which training must have an impact if it is to contribute to organizational effectiveness. Similarly, Ford et al. (2017) noted that for many jobs today, trained individuals must not only deal with routine situations but must adapt to nonroutine situational demands (Holyoak 1991, Hoffman et al. 2014). From this perspective, routine expertise focuses on building knowledge and skills so that individuals can quickly apply solutions or strategies to well-learned and familiar contexts and situations. With adaptive expertise, trainees are able to adjust or build upon knowledge and skills to generate new approaches and strategies to meet the demands of the novel situation. For example, a highly adaptable individual might see that the steps to being assertive are not working for certain types of clients and switch to a slower and more nuanced approach to sales for such clients. Research is needed to clearly distinguish measures of adaptability from our current measures of use and effectiveness.

Examining what is happening between training and our measures of transfer. The Blume et al. (2010) meta-analysis found that learning goal orientation, pretraining self-efficacy, and motivation to learn were all related to measures of training transfer. These predictor measures were taken prior to the trainee obtaining opportunities to apply the knowledge and skills gained in training. They further explored measures of transfer taken at some point after training in terms of either use or effectiveness and determined the vast majority of studies employed cross-sectional research designs. For example, results indicated that those higher in motivation to learn were found to have higher transfer scores. Nevertheless, the static relationships found in the meta-analysis were modest. One possible explanation of the findings is that predictive and criterion factors change over time once the individual gains on-the-job experience using the trained skills. For example, we know little or nothing about how factors such as motivation change (or remain stable) over time as a function of attempts to try out what was learned. Similarly, we need to know how the relationship between predictive and criterion factors changes based on the level of successful or unsuccessful attempts to apply training. We also have limited understanding of the relationship of use (e.g., number of times a skill is applied) and effectiveness. Put simply, it is time to connect the dots and study more intensively what is happening when learning from training meets the "real world" of work.

In the educational psychology domain, Hager & Hodkinson (2009) have argued for the need to study transfer not as an event but from the lens of the learner at the core of the learning process. From such a "learning from transformation" lens, transfer involves the study of how learning evolves from new understandings formed via experiences after the training period. A recent model in organizational psychology has begun to move toward this more dynamic approach to understanding training transfer (Blume et al. 2017). Their dynamic transfer model places an emphasis on understanding the linkages of initial intentions to transfer, early transfer experiences and the integration of feedback from those initial transfer attempts on subsequent transfer activities and outcomes. The researchers highlight the need to study the iterative cycle of events that lead to different patterns of transfer trajectories of use and/or effectiveness over time. For example, a trainee could be quite motivated upon the completion of some leadership training but then experience a failed initial attempt to apply some of the principles learned. Such an immediate failure (or pronounced success) could have a significant impact on subsequent attempts to apply the training. In addition, factors such as a trainee's level of conscientiousness could moderate the link between initial failures and subsequent attempts. This type of episodic model suggests that, to more fully understand the factors impacting transfer, we need to measure key factors such as perceptions of support over multiple time frames and tie them directly to the actual lived experience of the trainees as they attempt to transfer skills—including how successful or effective the attempts are. A recent study by Gielnik

et al. (2017) studied the short- and long-term effects of entrepreneurial training on self-efficacy and passion and ultimately on business creation. Over 32 months and four time periods, they found differences in efficacy, passion, and business creation for the trained versus the untrained entrepreneurial groups. In support of a dynamic perspective to transfer, they found that within the training group, trainees with high levels of self-efficacy after training became more passionate about entrepreneurship over time, whereas the low initial self-efficacy trainee passion scores decreased over time. The changing levels of passion were a strong predictor of business creation. More studies taking this type of dynamic perspective to understanding training transfer are clearly warranted.

Studying retention effects at the team level. Retention issues focus on the changes that occur in the form or level of knowledge, skills, or behaviors exhibited in the transfer setting. Previous retention research has focused at the individual task level of analysis. Connecting the dots will require extending this research into the domain of collective or team task retention.

Team tasks require competencies in task work and team process knowledge and skills (Salas et al. 2001, Paris et al. 2000). Given that task work competencies target specific technical knowledge and skills, the individual retention factors identified in our review are clearly relevant to understanding possible impacts at the team task level. At issue is the extent to which skill decay for one individual on task work can impact team performance and the extent to which others on the team can compensate for that decay while performing the team task (Ellis et al. 2005). Teamwork competencies include task sequencing, role responsibilities, and appropriate back-up behaviors (Bell et al. 2012), as well as planning and task coordination, information dissemination, and adaptability skills (Cannon-Bowers et al. 1995).

Adams et al. (2003) and Cianciolo et al. (2010) reviewed the literature on retention conducted in military contexts. They identified broad categories that can make a difference relevant to skill decay and team performance: team member characteristics, team task characteristics, and team processes. For example, retention and skill decay issues at the individual person level can have differential impacts on team performance depending on whether a task requires concurrent coordination in which two or more members must simultaneously execute their abilities toward a goal or more serialized organization where one task must be finished before another task can begin. In addition, the potential for error compensation, the need for information exchange required by a task, and the potential for correcting errors and redeploying resources all impact the relationship between individual skill decay and team performance. Training efforts related to backing up behaviors, contingencies, and adaptive performance can also impact the skill retention to team performance relationship (Adams et al. 2003).

Arthur et al. (2013b) studied three-person cross-trained teams on a multi-user computer-based simulated performance task. The study incorporated two extended nonuse intervals and found that teams demonstrated greater transfer and somewhat less performance decay than those in the individual training condition. They speculated that team characteristics such as task interdependencies may help mitigate skill loss and lessen the impact of novice performance conditions. Cooke et al. (2013) studied collective task retention using a simulation where team members worked collaboratively on a reconnaissance mission. They measured the team performance decrement as an indicator of team task skill retention over 8 to 10 weeks after training. Even though two of the three team roles showed skill decrements at the individual level, the team performance decrement was found to not be a function of individual skill decay functions. Rather, the levels of team situation awareness and coordination (and not the team knowledge measures) were predictors of team performance decrement. This finding suggests that team-level factors can help alleviate the negative effects of individual skill decay.

The few empirical studies that have attempted to examine factors impacting retention at the team level of analysis provide a useful start to going one step beyond. The studies, however, are preliminary and capture limited complexity underlying the conceptual and operational issues relevant to understanding retention and performance issues at the team level. Clearly, there is a critical need to conduct more systematic research at the team level on knowledge and skill retention of taskwork and teamwork competencies and their relationship to team performance over time.

One promising direction for research on teams is exemplified in a study by Hollenbeck et al. (2012), who argue that a categorical approach to studying team types inadequately models important variation in team characteristics. They conceptualize team characteristics along three dimensions: (*a*) skill differentiation—the uniqueness of the capacities members contribute, (*b*) authority differentiation—the extent to which decision-making power is held by an individual versus the group, and (*c*) temporal stability—the duration of a team and expectation of future collaboration. Variation along these dimensions can determine how teams interact and carry out their functions. For example, teams high in skill differentiation must rely on teammates for skills and capacities that would be unreasonable to develop across members, and as a result they may benefit more from training in team-level processes like coordination than cross-training on individual-level skills. Authority differentiation could also influence the nature of decision making (e.g., leader decision versus team consensus) prior to the expression of transfer. Finally, temporal stability may promote generalization and retention through repeated experience of performance/feedback cycles and increased accountability from the expectation of future collaboration (Lee et al. 2015, Marks et al. 2001).

Shifting the Paradigm

We end with a clarion call for a shift in our research paradigm around transfer-relevant issues. It is time for more consumer-centric research (Baldwin et al. 2017) whereby our research community more deliberately identifies the most important and relevant questions, the underinvestigated issues, and the applicable evidence that trainers and educators most need to design and execute effective learning experiences. This section focuses on the need to (*a*) study the types of training/learning activities that are occurring in organizations today (and likely in the future), (*b*) individualize our conception and study of transfer, and (*c*) conduct studies that are more problem centered.

Studying training transfer within the changing context of learning in organizations. One notable characteristic of the extant transfer literature is that much of it is based on training events that do not much resemble the way learning—and therefore transfer—often actually happens in organizations today. For example, although training was once synonymous with instructor-led, classroom experiences, a key learning event may now be more individualized, take maybe ten minutes, and happen closely proximate in time to when the learning is needed for application on the job!

As Ford & Meyer (2013) note, the changing nature of technology and work has led to instantly available knowledge and on-demand development of skills through the use of a variety of technological advancements such as virtual reality simulations, asynchronous training, and serious gaming. In addition, there is considerably more self-study (e.g., using online modules), experimentation, and informal learning that occurs in conjunction with (or instead of) formal training (Brown & Sitzmann 2011). Reliance on learning outside of formal training contexts has arisen out of increased demands on workers' time, budgetary restrictions, and geographically dispersed business units. The cumulative effect of these modes of learning has been estimated to account for as much as 75% of the learning that occurs in modern day organizations (Bear et al. 2008, Noe et al. 2014).

Therefore, for many people in organizations today, training is not viewed as a uniform or isolated event but more aptly described as a journey or episode—a series of cumulative stimuli and the cognitions associated with various types of learning experiences (Baldwin & Magjuka 1997). All training events occur among many organizational episodes experienced by those employees. For example, although formal learning opportunities and outcomes tend to be explicitly defined, in informal settings, employees themselves identify or create learning opportunities (Bell 2017, Enos et al. 2003). The informal learning process that occurs outside of any traditional training context (e.g., mentoring programs around core competency development) can significantly impact training transfer, and research that simultaneously examines the integration of formal training and informal learning to enhance core competencies is needed. Formal and informal dimensions of learning need to be seen as parallel rather than separate processes (Manuti et al. 2015). Sparr et al.'s (2017) recent study is a notable example of examining feedback seeking and reflection as informal, proactive learning behaviors in the transfer of formal leadership development training. They found that transfer of training was greatest for trainees who sought feedback (e.g., asking a colleague for feedback) and who actively reflected on their behaviors (e.g., reflecting on actions to learn from them and improve performance) in the post-training transfer context. Additional research that links formal and informal learning activities is needed—in particular research that avoids SS/SMC bias.

Cascio & Montealegre (2016) provide research questions that are relevant when moving from studying traditional training to learning contexts relevant to our new world of ubiquitous computing technologies, such as how to enable and support employee-centric training and development activities. We would add that organizations are interested in not only the individual training event but also the process of developing key competencies over time through a variety of learning opportunities (Beier et al. 2017). This requires the development of research agendas that go beyond a single training program to focus on multiple learning events and their impact on the development of core competencies (Ford et al. 2017). In addition, macro-level trends point to the increasing importance of pop-up businesses that have reduced barriers to market entry than large corporations (Davis 2016). For these types of businesses, the accelerated time to proficiency may become a critical factor in organizational success.

Individualizing transfer. The science of the individual is already transforming many of the basic assumptions and tactics of fields including medicine, biology, neuroscience, and genetics. For example, oncologists have switched their emphasis from standardized treatments for standard cancer to personalized treatments targeting individual cancers (Phan et al. 2009). Neuroscientists have begun to abandon their reliance on average brain maps in favor of individual brain maps. Nutritionists are moving from universal dietary recommendations to personalized diets (Dorner 2010).

In the realm of training transfer, the decision to transfer (especially for open skills) ultimately resides with each individual trainee. From an active learning perspective, we can view trainees as making personal choices to transfer—or not to transfer, as the case may be. The choice might more commonly be between what elements or aspects to transfer and what to leave behind. In this way, individual trainees customize or personalize the training process to fit their own conception of needs and wants from the experience (Baldwin et al. 2009).

This issue of customization or personalization of training transfer has been relatively ignored in the training literature, but research by Yelon and his colleagues (Ford et al. 2011; Yelon et al. 2004, 2013, 2015) has begun to shine some light on this personalization process. Medical professionals in relatively autonomous positions were interviewed about their intentions to transfer learning from recent educational programs. They then followed up to see what they actually transferred

and why—to tell their own story—similar to a learning history approach taken by organizational learning researchers (e.g., Kleiner & Roth 1996).

Research on training transfer could be enhanced by considering transfer as a conscious choice that individuals make throughout learning and the transfer context. One could study why an individual decides to attempt transfer and how organizations can help frame those choices. There are exciting new avenues such as using within-person analyses (Hardy et al. 2014) and experience sampling methodologies (Beckmann et al. 2010) for pursing these research questions that can lead to a greater understanding of the transfer process. As one recent example, Huang et al. (2017) examined within-person variability in mastery goal orientation and variability over time to measure various transfer trajectories for different trainees. They found that initial attempts to transfer had important implications for subsequent rate of change in transfer behaviors. Choi & Roulston's (2015) recent qualitative study examined the decision-making process of medical professionals deciding whether to integrate new learning into their clinical practice. They found that trainees had different perspectives on what was evidence for so-called good practice and that this individualized standard applied to the training led to different conclusions by trainees as to whether the training provided enough credible research evidence to lead the trainee to apply the training to their clinical practice.

Another intriguing stream of recent research is that focused on "star performers"—those few individuals in any organizational context who account for a disproportionate amount of output in relation to their peers (also see Aguinis & O'Boyle 2014, Aguinis et al. 2016). Aguinis and colleagues argue that our theories and practices concerning individual performance should be revisited to consider the presence of stars and the underlying power law distribution of performance. In the context of training and development, "star trainees" might be defined as those who are able to transfer substantially more learning than others who have received the same training. As we noted earlier, conventional training practices are deeply embedded in homogeneity of trainees and normal distributions of learning outcomes. So, thinking in terms of star trainees, or star learners, may indeed have a profound effect on training practice and transfer research. For example, explorations of individual profiles likely to produce disproportionate levels of transfer are clearly warranted.

Investigating research questions that are problem centered. A key constituency of transfer research is the community of learning professionals who design and implement training initiatives. Such professionals are rightfully interested in evidence-based interventions that have been shown to positively influence transfer. Although we have evidence-based findings, one of the predominant limitations of the research literature is that it continues to be nonaction oriented. That is, most existing studies stop at the point of identifying, describing, or measuring factors that may influence transfer (Roe 2008) without investigating how those factors might be effectively changed or managed within the workplace or training context to enhance transfer.

Baldwin et al. (2017) have called for a shift to what they term a consumer-centric approach to transfer research in order to critically examine which research questions we ask—and which we do not—that would be most applicable to learning professionals tasked with the design, implementation and support of effective learning experiences. Such an approach requires more systematic reporting of information related to training (trainers, trainees), design (needs assessment, training objectives, learning principles incorporated into design, delivery mechanisms), and work context under study, a focus of research on optimization of transfer, and development of more organizationally relevant outcome measures.

As one example, in today's fast-paced world, a key criterion is time to proficiency. But just using average scores on our traditional measures of effectiveness provides limited information

that is relevant to enhancing our understanding of time to proficiency requiring a rethinking of our criterion measures. It also points to the need to connect multiple formal and informal learning activities and studying how they can be sequenced in an optimal way to decrease the time to proficiency. Ford et al. (2017) provide suggestions for learning strategies that can move individuals from relative novice status to full proficiency and ultimately (for some individuals) to becoming an expert in a domain. We are in need of research that uses time to proficiency as a key criterion measure and that begins to test out optimal sequencing of learning events and transfer experiences that speed up this move to proficiency across a variety of competencies.

Such research on time to proficiency also needs to focus more on what have been termed "mission-critical jobs" in organizations (Hoffman et al. 2014). These are jobs central to the current and future success of an organization. For example, robots are currently analyzing documents, filling prescriptions, and handling other closed-skill tasks that were once exclusively done by people—even including the automation of pizza making and delivery (Kendall 2016). A problem-oriented approach therefore steers scholars away from jobs on the decline and toward those jobs that require deep specialization that needs to be developed over time, for example, jobs maintaining and setting up complex machinery or those that require expertise in decision making, planning, or creative applications. The most valuable future transfer research will investigate the types of jobs that machines cannot easily replace and where time to proficiency (or expertise) is critical to organizational effectiveness.

Finally, as many organizations go global, one issue is the extent to which cultural factors need to be taken into account when planning, implementing, and supporting training programs. Although we know that cross-cultural training programs for expatriates can be helpful and enhance performance and retention (Deshpande & Viswesvaran 1992, Morris & Robie 2001), with globalization, a separate issue is whether cultural factors matter relevant to transfer when conducting the same training program across various sites around the world for multinational companies. Using cultural dimensions such as individualism/collectivism, power distance, and uncertainty avoidance (House et al. 2002), Yang et al. (2009) have posited research propositions around a model of how cultural factors could impact acquisition and transfer. For example, trainee motivation to learn in individualistic cultures may be higher when training is perceived to increase the competencies of individuals, whereas in collectivistic cultures motivation may be higher when training is perceived to benefit the workgroup. In high uncertainly avoidance cultures, training tactics that show established and proven best practices are posited to have more impact. These types of propositions have yet to be tested. In addition, the studies on lessons from experience (DeRue & Wellman 2009; McCauley et al. 1994, 2006) need to be expanded to investigate effectiveness of various experiences as a function of culture differences.

Although the expansion of transfer research into global contexts is certainly timely and warranted, we would also note that the search for universals—findings that transcend cultural boundaries—can be as or even more fruitful than the discovery of differences. Prior research has suggested that there may well be more universal I/O findings than typically assumed. Our collective understanding of transfer would be furthered with the specification of factors known to operate similarly across cultural lines (Aguinis & Henle 2003, Kraut & Mondo 2009). As such, whether cultural factors moderate transfer relationships or simply confirm what has been found in domestic studies is a fertile arena for future study.

CONCLUSION

Our understanding of the factors that encourage or inhibit transfer has clearly advanced. We have broadened the lens of the transfer spectrum to include factors pre, during, and post training, and

we have narrowed the list of individual differences that have been shown to relate to transfer. The distinction of designing for acquisition and designing for transfer has led to teasing out design elements that enhance transfer. We have more clearly specified the range of transfer criteria and demonstrated the critical importance of explicating the particular criteria employed. Various interventions have been tested, and we have learned that transfer is stubborn. This difficulty highlights the folly of organizations investing their time and money almost exclusively on training and viewing transfer as free, i.e., not worthy of heavy investment. So, although we would categorically reject any suggestion that transfer scholars have not substantively advanced what is known, there is also legitimate concern that the transfer problem remains acute and there is so much more of value that remains unknown. We know little about what types of support are, and when and where such support is, most effectively manifested. We have a body of research that has generally treated training as an event, not an episode, and we thus have too little evidence regarding formal and informal learning and the trajectories of transfer. The reality is that organizations spend enormous amounts of money on employee training and education and, in the aggregate, it seems to make a difference. But we contend that they could be getting a better return on their investment. One objective of our review was to acknowledge and celebrate what is known, and we have tried to synthesize and clarify that knowledge here. But the challenge ahead is to confront the unknown by studying transfer in new and more contemporary ways that provide useful insights for the benefit of those who actively design and execute training initiatives.

DISCLOSURE STATEMENT

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