Convergent and Divergent Validity of the Learning Transfer System Inventory

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The Learning Transfer System Inventory (LTSI) was developed to identify a select set of factors with the potential to substantially enhance or inhibit transfer of learning to the work environment. It has undergone a variety of validation studies, including construct, criterion, and crosscultural studies. However, the convergent and divergent validity of the instrument has not been studied. Such a study is necessary to define the nomological network on the constructs. This study examines the convergent and divergent validity of the LTSI with twenty-eight comparison measures. Results indicate mostly divergent relationships, further demonstrating the uniqueness of the LTSI constructs. By establishing the divergent relationship with other known constructs, the LTSI's usefulness for transfer research is enhanced.

In 1996, Holton and Bates developed the learning transfer system inventory (LTSI) as a generalized transfer climate instrument that could be used across a wide variety of organizations, training programs, and employees. The LTSI, based on evaluation theory, was developed by examining relationships and constructs from previous empirical research in a grounded theory-building approach (Holton, 1996). Holton, Bates, and Ruona (2000) indicated that "without minimally validated measures, the chance for substantive misspecification of models, misinterpretation of findings and measurement error is significantly increased" (p. 6).

Most human resource development (HRD) professionals realize that their organizations need learning transfer improvement, but few have an accurate sense of what the problem is. As a result, even those aware of strategies to improve transfer (Broad & Newstrom, 1992) are left with only intuition and

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guesswork to guide them to those most likely to yield high returns. Yet most would agree that improving learning transfer systems requires an ability to accurately diagnose factors inhibiting transfer.

The primary reason for this paradox is that until recently, no diagnostic tool had emerged. In recent transfer research, a wide variety of instruments and measures have been used, most with either questionable or unknown psychometric properties. As a result, neither practitioners nor researchers have had a well-validated, effective diagnostic instrument. This presents a key barrier because it is hard to change a transfer system without accurate diagnosis of system problems.

The lack of a comprehensive set of factors to measure learning transfer climate, which are generalizable to a wide variety of organizations and employees, is an issue that research should continue to address. The development of a generalized set of transfer factors would facilitate cross-study comparison and eliminate redundant instrument development efforts (Holton et al., 2000).

Ford and Weissbein (1997) conducted a review of empirical literature on transfer of training that updated the earlier Baldwin and Ford (1988) study. Their study indicated a continuing problem with instrumentation in transfer research. For example, nine of the studies identified used a survey design (Facteau, Dobbins, Russell, Ladd, & Kudisch, 1995; Ford et al., 1992; Quinones, Ford, Sego, & Smith, 1995; Roullier & Goldstein, 1993; Tesluk, Farr, Mathieu, & Vance, 1995; Tracey, Tannenbaum, & Kavanagh, 1995; Warr & Bunce, 1995; Xiao, 1996) that could be considered comparable to the study examined in this chapter. Although all of these studies calculated internal reliability coefficients, only two (Tracey et al., 1995; Warr & Bunce, 1995) used factor analysis as a part of the instrument validation process. The remaining studies used more rudimentary validation procedures, such as simple content analysis, to make items as specific as possible (Facteau et al., 1995) or comparing intrascale reliability to interscale correlations to establish discriminant validity (Xiao, 1996). This lack of attention to instrument (construct) validation is even more alarming when it is recognized that for nearly every study reviewed, new customized transfer climate scales were developed.

The measurement of transfer climate constructs has been a problematic issue in learning transfer research. Transfer research over the past two decades indicates that a wide variety of instruments and measures have been used that often have questionable psychometric qualities or provide little evidence that they measure what they purport to. We believe that the development of a theoretically based, psychometrically sound, and generalizable set of transfer climate factors is imperative if learning transfer research and practice is to move forward. Such a set of factors could assist researchers and practitioners by reducing measurement error, increasing predictive accuracy, and adding to the understanding of the learning transfer process and the factors that affect it. It would also facilitate more meaningful cross-study comparisons and minimize

the need to develop "new" measures to assess analogous constructs (Holton, 1996; Roullier & Goldstein, 1993; Tracey et al., 1995).

For practitioners, having a valid and reliable measure such as the LTSI enhances transfer because they can use such an instrument to:

- Assess potential transfer factor problems prior to conducting major learning interventions.
- Follow up on evaluations of existing training programs.
- Investigate known transfer problems.
- Target interventions designed to enhance transfer.
- Incorporate evaluation of transfer as part of regular employee assessments.
- Conduct needs assessment for training programs to provide transfer skills to supervisors and trainers.

Thus, the development of a research-quality diagnostic instrument to assess critical transfer factors is important to both researchers and practitioners. There is no reason that a single tool cannot be useful in both arenas. Indeed, there are far too many diagnostic instruments sold for HRD practice that have not been tested and have no known validity.

For the past several years, our efforts have been directed at moving toward this goal through the development of the LTSI. The LTSI was developed to identify a select set of factors with the potential to substantially enhance or inhibit transfer of learning to the work environment. In early development of the LTSI, Holton, Bates, Seyler, and Carvalho (1997) factor-analyzed nine constructs for transfer climate. Holton et al. (2000) expanded the instrument by fitting the factors to an evaluation model (Holton, 1996) and including additional motivation-related (for example, expectancy and motivation to transfer), ability-related (for example, personal capacity for transfer), and trainee-characteristics-related factors (for example, learner readiness and performance self-efficacy). Exploratory factor analysis of the resulting sixteen factors with a large heterogeneous sample provided evidence of construct validity.

Since then, the LTSI has undergone continuing validation. Several studies (Bates & Holton, 2004; Holton, Chen, & Naquin, 2003) have used the LTSI in different organizational settings. Four studies have provided evidence of the cross-cultural validity of the instrument: Yamnill (2001) in Thailand; Chen, Holton, and Bates (2005a) in Taiwan; Khasawneh, Bates, and Holton (2004) in Jordan; and Bates, Kauffeld, and Holton (2005) in Germany. In addition, three studies provided evidence of criterion validity and suggested that several work environment factors measured by the LTSI, especially for interpersonal supports, were powerful predictors of individual job performance following training (Bates, Holton, & Seyler, 1997; Bates, Holton, Seyler, & Carvalho, 2000) and motivation to transfer (Seyler, Holton, Bates, Burnett, & Carvalho, 1998). Another criterion validity study of the LTSI (Ruona, Leimbach, Holton, & Bates,

2002) suggested that reaction utility might be indirectly related to performance and directly related to motivation to transfer.

Ongoing Construct Validation of the LTSI

The goal of construct validation research is to provide evidence that research instruments accurately measure what they purport to. Construct-related evidence focuses primarily on the instrument score as a measure of the characteristic of interest. It demonstrates the degree to which a score on a measure reflects the true score of the hypothetical construct (American Educational Research Association, 1985).

There are three major objectives of construct validation. First, researchers should specify the domain of observables related to the construct. This means working from theory and empirical research to identify other constructs related to the construct of interest, such as learning transfer climate. Second, empirical efforts are made to determine the extent to which the constructs of interest tend to measure the same thing, several different things, or many different things. Third, researchers should perform subsequent studies or experiments to determine the extent to which supposed measures of constructs are consistent with best guesses about the construct (Nunnally & Bernstein, 1994). This could, for example, include efforts to understand what other constructs might or might not be correlated with the constructs of interest.

Although satisfying these three objectives can provide the complete construct validation data, it is rare that all are pursued in the development of measurement instruments. Researchers "often develop a particular measure of a construct, skip aspects one and two and move directly to three and try to find interesting relations between their measure and measures of other constructs" (Nunnally & Bernstein, 1994, p. 87). The authors of the LTSI addressed the first two aspects by identifying and examining potential factors that are important to the transfer learning climate. The next logical step in the construct validation process would be to gather evidence of the convergent and divergent validity of the LTSI.

Convergent validity is concerned with "demonstrating that two independent methods for inferring an attribute lead to similar ends" (Nunnally & Bernstein, 1994, p. 92). In practice, convergence is often demonstrated by examining the extent to which measures of the same or similar variables are correlated. The underlying assumption is that a measure accurately represents a variable if it correlates highly with other measures of the same or similar variable.

Divergent validity is concerned with the extent to which a measure is novel in the sense of measuring something different from that provided by other measures. Divergence is thus concerned with empirically establishing a measure's relative uniqueness. Divergent validity is evidenced when different attributes of theoretical interest are not correlated to an extremely high degree; that is, they share little common variance (Whitley, 1996).

Convergent and divergent validity studies also present an opportunity to begin to map the nomological network of the LTSI. Cronbach and Meehl (1955) argued that one way to provide additional evidence of a construct's validity is to develop a nomological network. The term *nomological,* derived from Greek, means lawful. A nomological network can therefore be thought of as a lawful network of relationships or linkages between constructs (Trochim, 1996). Thus, the development of a nomological network can provide evidence of construct validity to the extent that predictions such as correlations from a formal theoretical network containing the construct or measure of interest are confirmed.

Two objectives guided this study. First, because no nomological network for learning transfer climate has been identified, one objective was to begin to build such a network by relating LTSI constructs to a set of theoretically sound comparison constructs. Second, we wanted to provide evidence of the convergent and divergent validity of the constructs measured by the LTSI by examining the extent to which expected correlations between LTSI measures and comparison measures are supported. Our research was therefore framed by the following questions:

1. What theoretically based, psychometrically valid comparison measures of constructs in the nomological network of the LTSI can be used to examine the convergent and divergent validity of the LTSI?
2. What are the convergent and divergent associations between the LTSI scales and the comparison measures identified in question one?

Transfer-of-Training Research

The concept of training transfer is not new in the literature. Baldwin and Ford (1988) conducted a thorough review of the literature on transfer of training based on publications cited in major works on organizational training. They defined training transfer as the degree to which trainees apply to their jobs the knowledge, skills, behaviors, and attitudes they gained in training (Baldwin and Ford, 1988). Quinones, Sego, Ford, and Smith (1995) described transfer in simple terms of individuals exhibiting the behaviors learned in training back at the workplace. However, transfer of training is a complex process. Baldwin and Ford (1988) define it in terms of training-input factors, training outcomes, and conditions of transfer. Generalization of material learned on the job and maintenance of material over a period of time are considered conditions of transfer. That is, a trainee is expected to generalize the concepts learned during training and apply them to real-life work situations beyond the training context and maintain this behavior over a long period of time. In other words, transfer of training is observed in terms of generalization and maintenance behaviors. The quality and the extent to which maintenance and generalization

behaviors are observed are largely determined by training outcomes or the amount of original learning that occurs on the job and retention of the material provided during training. In turn, the training outcomes are dependent on the combination of training-input factors. The input factors are subdivided into three sections: training design, trainee characteristics, and work-environment characteristics.

Training-transfer reviews and articles (Baldwin & Ford, 1988; Bates, 2003; Ford & Weissbein, 1997; Bates et al., 2005) define *transfer* as a progression of events from pretraining experiences to the acquisition of cognitive knowledge and skills, to the capability to apply new learning to job-related tasks, to the application of learning to tasks and activities beyond those initially targeted by the training. Thus, by properly measuring and creating the most favorable combination of input factors, one may influence training outcomes and, eventually, training transfer.

The transfer of training is affected by a number of factors that can be classified into three categories: trainee characteristics, training design, and work environment. Baldwin and Ford (1988) describe the trainee characteristics factors in terms of ability, personality, and motivation. Holton et al. (2000) also include prior experiences and efficacy beliefs as constituents of trainee characteristics category. Personality factors have been described in detail by Barrick and Mount (1991) as affecting job performance. As one of the criteria of job performance, training proficiency is specifically affected by openness to experience, conscientiousness, and extraversion. A wide range of cognitive, psychomotor, and physical ability constructs may also transfer task performance. Holton et al. (2000) indicate that a set of fifty descriptor constructs for ability characteristics that influence task performance has been developed by Fleishman and Mumford (1989). Other personality characteristics like locus of control (Kren, 1992), job involvement (Noe & Schmitt, 1986), and organizational commitment (Mathieu & Zajac, 1990) are said to affect training-related motivation. Self-efficacy as a social learning concept has been suggested to affect training transfer through confidence in the ability to perform trained tasks (Ford & Weissbein, 1997). Ford, Quinones, Sego, and Sorra (1992) determined that opportunities to perform trained tasks are differential and in part determined by trainees' self-efficacy and cognitive ability, along with supervisor attitudes and work group support.

Training design has been researched probably more than any other factors affecting transfer (Baldwin and Ford, 1988). Baldwin and Ford (1988) describe training design research as centered on four basic principles: identical elements, general principles, stimulus variability, and conditions of practice. The principle of identical elements calls for identical stimulus and response elements in transfer settings. General principles indicate that a trainee should be taught not just applicable skills but also general rules and theoretical principles that underlie training concept. Stimulus variability is the notion that positive transfer is maximized when a variety of relevant training stimuli

(that is, different examples rather than just one example) are employed. Finally, conditions of practice include feedback, massed or distributed training, and overlearning. Baldwin and Ford (1988) provide the detailed descriptions of each of these principles. Essentially research suggests that training tasks should be similar to transfer tasks or tasks that employees are asked to do on the job using new skills or knowledge (Goldstein and Musicante, 1986). Also, Bates et al. (1997) argue that training content has to be consistent with job requirements. It is essential that training tasks be similar to transfer tasks (Goldstein & Musicante, 1986).

In 1988, Baldwin and Ford stated that research on the work environment was limited at that time. Ten years later, Ford and Weissbein (1997) found that more effort had been devoted to a greater understanding and measurement of work environment in which the trainee was supposed to transfer the new knowledge and skills. There are essentially two key situations or environments that a person works within: the training environment and the transfer environment. The researchers suggest that trainee characteristics and transfer environment interact in the application of the knowledge and skills brought to the job. Therefore, if the transfer environment is favorable and the trainee possesses necessary characteristics, he or she is likely to be more motivated to transfer training to the job.

Noe and Schmitt(1986) linked environmental favorability to pretraining motivation and transfer of training skills. The environmental favorability comprises task constraints and perceived social support for training. Roullier and Goldstein (1993) suggested that transfer climate comprises situational cues (reducing the employee's workload so new skills could be applied at work) and consequences (rewards and reinforcement). Baldwin and Ford (1988) described several sources of social support: top management, supervisor support, peer support, and support by subordinates. Facteau et al. (1995) provided empirical evidence for the positive relationship between pretraining motivation and perceived transfer of training. They also determined the strong relationship between supervisor support and pretraining motivation. Peer support was not significantly related to pretraining motivation, and subordinates and top management support were negatively related. Brinkerhoff and Montesino (1995) found a significant relationship between management support and transfer of training. Therefore, one can argue that the favorability of the transfer climate is contingent on several factors: peer support, supervisor support, availability of resources to apply new knowledge and skill (such as time, tools, and human resources), a rewards system in place with positive reinforcement, and negative reinforcement (sanctions, punishment).

The set of influences described is defined as the transfer system. It is a much broader construct than transfer climate. Transfer climate alone does not constitute the whole set of influences on transfer of training. As Holton et al. (2000) state, it also includes training design, personal characteristics, opportunity to use training, and motivational influences. Therefore, training

transfer can be understood only by examining and evaluating the complete set of influences described above. At the same time, these factors have to be carefully managed and fostered in organizations in order to implement training interventions successfully.

Nevertheless, it is evident that often the analysis of transfer system is underused or even neglected, and not enough attention is given to measuring the constituents of the system. Georgenson (1982) estimates that of the expenditures for training and development in American industry, only 10 percent actually result in a transfer from the training to the job. Indirect costs of on-the-job training, combined with formal training costs, range between $200 billion and $400 billion a year (Holton et al., 1997). Ultimately, because of poorly assessed training input factors, improperly designed training, and unfavorable training transfer environment, what is learned in training is rarely applied on the job.

Methodology

Two sets of procedures were used in this study for data collection. First, an extensive review of literature was conducted to identify a set of comparison measures against which to evaluate the convergent and divergent validity of the LTSI scales. Second, data were collected and analyzed in order to examine the correlations between the comparison measures and the LTSI scales.

Learning Transfer Systems Inventory. The most recent version of the LTSI contains sixty-eight items, which are subdivided into two domains: Training Specific and Training in General. The first domain contains forty-five items and the second domain twenty-three items. There are four sets of factors in the instrument: Motivation, Work Environment, Ability, and Secondary Influences. Overall factor analysis revealed sixteen factors. This version of LTSI also contains twenty-one research items, which are being tested for their validity. These items have been shown to work well in cross-cultural settings in studies described earlier.

The LTSI originated after critical analysis of Kirkpatrick's four-level evaluation model (Holton, 1996). Holton et al. (2000) propose a new model to evaluate training transfer specifically, which provides the theoretical frame for the instrument. Four domains are considered in the conceptual model of organizational performance improvement from training. Each domain represents a system of factors important to learning, individual performance, and, ultimately, organizational results:

- Motivational factors are direct measures of transfer-related motivation (Motivation to Transfer) and two measures that stem from Vroom's expectancy theory (Transfer Effort–Performance Expectations and Performance–Outcome Expectations) and are intended to assess transfer-related expectations.

Motivation to Transfer measures the extent to which individuals are motivated to use learning in their work and therefore plan to use new skills and knowledge which will help them perform more effectively on the job. Transfer Effort–Performance Expectations measures the extent to which individuals believe that applying new skills and knowledge learned will improve their performance. In turn, the Performance–Outcomes Expectations scale assesses the extent to which employees believe that applying new knowledge learned in training will lead to some kind of recognition valuable and meaningful to them.

- Secondary influences, which can also be classified as trainee characteristics scales, are presented by Learner Readiness and Performance Self-Efficacy. Learner Readiness relates to the degree of the preparedness of the trainee to enter training, including knowing what to expect during training and understanding how training is related to job and work performance. Performance Self-Efficacy is essentially the trainee's belief that he or she will be able to use the learned material on the job to improve performance. In other words, this scale represents the confidence of the employee that he or she can overcome obstacles that hinder the use of new knowledge and skills at work.
- Environmental elements or factors are measured by three scales that address employee-supervisor relationship: Supervisor Support for Transfer, Supervisor Sanctions, and Performance Feedback. Essentially these scales address managers' involvement in clarifying performance expectations after training, identifying opportunities to use new knowledge and skills, setting realistic goals based on training, and working with individuals on problems encountered. On the negative side, Supervisor Sanctions indicate the degree of opposition to application of new skills and knowledge, lack of assistance to identify opportunities to use new skills, and providing negative or inadequate feedback when individuals successfully apply learning on the job. The Peer Support and Openness to Change scales assess the work-group-related factors that influence training transfer. The Peer Support scale aims to establish whether peers mutually implement opportunities to apply skills and knowledge learned in training, encourage each other to use new skills, and display patience and appreciation for the use of new skills. The Openness to Change scale addresses the extent to which work groups are willing to invest energy to change and provide support to individuals who use new techniques learned in training. The reward system in place in organizations and the rewards an employee expects for successful training completion and implementation of new knowledge and skills on the job are important constructs that influence the amount of transfer on the job. These factors are measured by two scales: Performance Outcomes Positive and Performance Outcomes Negative. Positive outcomes delineated here include increased productivity at work, increased personal satisfaction, respect, increase in salary or other types of rewards, and promotion. Negative outcomes include reprimands, penalties, peer resentment, and lack of rewards.

• Ability elements have been discussed in transfer research as some of the most important elements affecting transfer of training on the job. The ability to apply learning to the job setting is addressed by the Opportunity to Use Learning scale and the Personal Capacity for Transfer scale. The Opportunity to Use Learning scale is designed to measure the extent to which an employee is given the opportunity to apply what he or she learned during training in terms of adequate equipment, information, human and financial resources, materials, and supplies. The Personal Capacity for Transfer assesses the extent to which individuals' workload, schedule, personal energy, and stress level facilitate or inhibit the application of new knowledge and skills. It is important that training be consistent with job requirements and skills and knowledge taught in training be similar to performance expectations. The adequacy of these elements is measured by the Perceived Content Validity scale. Finally, the Transfer Design scale measures the extent to which training has been designed to clearly link learning with on-the-job performance through the use of clear examples, methods, and activities.

Procedures: Research Question 1. To address research question 1, an extensive systematic search of literature was conducted to identify comparison measures for the LTSI factors that were used in this study. The review included resources such as relevant journals from a variety of disciplines, books, and other literature using the Educational Resources Information Center, Dissertation Abstracts International, the Library Information System, and ABI/Inform (produced by University Microfilms International). Search terms thought to relate to the learning transfer climate constructs were identified: *learning climate, transfer environment, business climate, organization environment, psychological climate, work environment, organizational climate, organizational culture, learning culture,* and *organizational behavior.*

The goal of our review was to find a set of psychometrically sound comparison scales from those available either in the research literature or commercially. Because there were no other measures of learning transfer climate available when this study was conducted, comparison measures had to be drawn from a variety of instruments that measured related but different constructs. The procedures for identifying comparison measures were based on instrument development criteria outlined by Robinson, Shaver, and Wrightsman (1991) and Nunnally and Bernstein (1994). These criteria were used as a screening device to narrow the large volume of potential measures. The goal was to find instruments or measures that best met these criteria. Table 1 shows the criteria used for identifying and screening possible comparison instruments and the steps used for each criterion.

Next, the psychometric qualities of the instruments that passed the first screen were assessed. The adequacy of measures was evaluated with the Robinson et al. (1991) framework. The framework involved examining the theoretical development structure, available scale norms, inter-item

Table 1. Criteria and Steps Used in Identifying Candidate Measures for Comparison with LTSI Factors

Criteria	*Steps*
1. The purpose and intended use of candidate measures were examined to determine similarities or differences from the measure of interest.	1. A thorough review of the factors comprising the LTSI instrument was made (for example, definitions, examples, and researcher-perceived inferences).
	2. Instruments developed for the purpose of measuring a variety of factors related to the learning transfer climate (for example, learning climates, business climate, transfer environment, organizational behavior, work environment, and psychological climate) were considered.
	3. Instruments that were intended for use in a variety of organizational work environments with a wide variety of employees were considered.
	4. Instruments that were intended to measure employee perceptions of the training and work environment as opposed to how they desire the workplace to be were considered.
	5. Instruments that were intended to analyze individual-level responses, as opposed to group- or unit-level analysis of responses, were considered.
	6. Instruments that were self-administered and did not need outside facilitation were considered.
2. Instruments with scales and scale items related to the items in the measure of interest were candidates.	1. The constructs, classification schemes, dimensions, scales, and scale items for potential comparison measures were examined to logically determine similarities to or differences from the factors in the nomological network of the LTSI.
	2. Scales that had twenty or fewer items were considered for the study. The length of the instrumentation used in the study was a major factor.
	3. Scale items with clear, simple language were considered because the instrumentation is to be administered to a wide variety of employees of varying educational levels.

(Continued)

Table 1. (***Continued***)

Criteria	*Steps*
3. Developmental studies for the candidate measures were examined to determine the methodology used.	1. Measures with data generated with samples similar to those used for the development of the LTSI were used. Instrument development studies using individuals working in companies or organizations in the public and private sectors were considered.
	2. A review of the techniques (survey, interviews, and observation) used in the developmental studies was made to determine similarities to or differences from the LTSI. The LTSI used the survey technique for data collection. Therefore, only instruments with questionnaires were used in this study.

correlations, coefficient alphas, factor analysis results, test-retest reliability, convergent validity, and divergent validity. Using a four-point scale (4, Exemplary; 3, Extensive; 2, Moderate, 1; Minimal, 0, None), the researchers rated each potential comparison scale against these criteria. Few instruments were found that fully met all of the criteria. Thus, the final selection instruments often required balancing a trade-off of theoretical, practical, and psychometric issues. This was due in part to the lack of the attention to measurement issues in past research.

For practical reasons of instrument length, only two scales were selected for comparison with each LTSI scale used in the study. This approach reduced the number of items used in the instruments to a manageable level. In all, forty-two scales were used in this study, including fourteen of the sixteen LTSI scales and twenty-eight comparison measures. Two of the LTSI scales were excluded from this analysis because suitable comparison measures could not be found.

Procedures: Research Question 2. This section describes the research procedures used to assess the relationship between the comparison measures and the LTSI scales.

Sample. Two hundred thirty-seven participants in training programs from a large quasi-public organization completed the instruments. The respondents, in five training satellite offices from five states, were from the Midwest district. The employees represented a variety of job levels in the organization: craft employees such as clerks and carriers, first-line supervisors, and middle management (for example, managers and postmasters). Data were collected during training sessions or programs in which subjects participated. The training sessions and programs ranged from 4 hours to 104 hours, with only four participants completing the 104-hour training session and fourteen completing 80 hours of training. The majority of the training ranged from 4 to 32 hours.

Participants returned 204 usable sets of data. This provided a sample with adequate power to detect significant correlations of .20 or higher. Correlations below .20 were considered too small to be meaningful in defining the nomological network of constructs related to the LTSI.

Measurement Instruments. The fourteen LTSI and twenty-eight comparison scales yielded 322 items. Because of the large number of items and concerns about respondent fatigue, the items were divided into two survey instruments: one was administered at the beginning of the training class and the other at the end of the class. All of the LTSI scales were in the second administration because it is designed to be administered at the end of training. The first survey instrument, administered at the beginning of training, contained only comparison scales. To balance the number of items between the two instruments, some of the comparison scales were included with the LTSI items in the second survey administered at the end of the training class. Table 2 shows the LTSI scales, their definition, a sample item from each scale, and the reliabilities of each scale.

Because of the time span between completing the first and second instruments, there was a concern that the training might create an attitude change that would influence trainee responses to the two instruments. Therefore, an effort was made to statistically control for mood change between the beginning and the end of the training sessions. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegan, 1988) was added to assess any mood shifts that participants experienced between the beginning and the end of the training session that might have influenced the data. The PANAS consisted of twenty terms (ten positive and ten negative) rated along a five-point Likert-type scale (1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit, and 5 = extremely). Respondents were asked the extent to which they experienced each mood state during a specific time frame. For this study, respondents were asked to indicate the "extent you feel this way right now, that is, at the present moment." The "present moment" time frame was used to capture state affectivity at the beginning and end of training. Dependent *t*-tests were calculated to determine if the means for the beginning and ending scores differed significantly, suggesting a shift in the mood of the participants between the beginning and end of the sessions. Pearson's correlations were also calculated for PANAS scales to examine the individual differences in the positive and negative scales.

Administrative Procedures. Training specialists for the Midwest district were administered the questionnaires. They were provided a prepared script explaining the purpose of the study and directions for completing the questionnaires. The script was read to the participants to ensure consistency of the message. Completed questionnaires were returned to the researchers for processing.

Data Analysis. Pearson's product moment correlation statistic was used in most cases to examine the associations between the LTSI scales and the

Table 2. LTSI Scale Definitions and Sample Items

Factor	*Definition*	*Sample Item*	*Number of Items*	α
Training-specific scales				
1. Learner Readiness	Extent to which individuals are prepared to enter and participate in training.	Before the training I had a good understanding of how it would fit my job-related development.	4	.73
2. Motivation to Transfer	Direction, intensity, and persistence of effort toward using skills and knowledge learned in a work setting.	I get excited when I think about trying to use my new learning on my job.	4	.83
3. Personal Outcomes—Positive	Degree to which applying training on the job leads to positive outcomes for the individual.	Employees in this organization receive various perks when they utilize newly learned skills on the job.	3	.69
4. Personal Outcomes—Negative	Extent to which individuals believe that not applying skills and knowledge learned in training will lead to negative personal outcomes.	If I do not utilize my training I will be cautioned about it.	4	.76
5. Personal Capacity for Transfer	Extent to which individuals have the time, energy, and mental space in their work lives to make changes required to transfer learning to the job.	My workload allows me time to try the new things I have learned.	4	.68
6. Peer Support	Extent to which peers reinforce and support use of learning on the job.	My colleagues encourage me to use the skills I have learned in training.	4	.83
7. Supervisor Support	Extent to which supervisors or managers support and reinforce the use of training on the job.	My supervisor sets goals for me which encourage me to apply my training on the job.	6	.91
8. Supervisor Sanctions	Extent to which individuals perceive negative responses from supervisors or managers when applying skills learned in training.	My supervisor opposes the use of the techniques I learned in training.	3	.63

9.	Perceived Content Validity	Extent to which trainees judge training content to accurately reflect job requirements.	What is taught in training closely matches my job requirements.	5	.84
10.	Transfer Design	Degree to which (1) training has been designed and delivered to give trainees the ability to transfer learning to the job and (2) training instructions match job requirements.	The activities and exercises the trainers used helped me know how to apply my learning on the job.	4	.85
11.	Opportunity to Use	Extent to which trainees are provided with or obtain resources and tasks on the job enabling them to use training on the job.	The resources I need to use what I learned will be available to me after training.	4	.70
General scales					
12.	Transfer Effort–Performance Expectations	Expectation that effort devoted to transferring learning will lead to changes in job performance.	My job performance improves when I use new things that I have learned.	4	.81
13.	Performance–Outcomes Expectations	Expectation that changes in job performance will lead to valued outcomes.	When I do things to improve my performance, good things happen to me.	5	.83
14.	Resistance to Change	Extent to which prevailing group norms are perceived by individuals to resist or discourage the use of skills and knowledge acquired in training.	People in my group are open to changing the way they do things.	6	.85
15.	Performance Self-Efficacy	An individual's general belief that he or she is able to change performance when he or she wants to.	I am confident in my ability to use newly learned skills on the job.	4	.76
16.	Performance Coaching	Formal and informal indicators from an organization about an individual's job performance.	After training, I get feedback from people about how well I am applying what I learned.	4	.70

comparison measures. However, three of the comparison measures consisted of dichotomous data requiring a true-false response. For these comparisons, the point biserial correlation was used. The following framework was used to describe the magnitude of correlation:

- .00 to .19, negligible association
- .20 to .49, low association
- .50 to .69, moderate association
- .70 to .85, high association
- .86 to 1.00, very high association (Ary, Jacobs, & Razavieh, 1996)

Pearson's partial correlations measure the strength and direction of a relationship between two variables while controlling for the effect of one or more additional values (Nunnally & Bernstein, 1994). For this study, partial correlations are used for any comparison between a scale on the instrument administered at the beginning of training, partialing out the effect of mood change as measured by the PANAS. For comparison scales included on the same survey instrument as the LTSI factors, a simple Pearson correlation was sufficient.

Results

This section reports the results of the two research questions.

Research Question 1: Comparison Measures Selected for Use. Of the fifty-two scales investigated for use in this study, seventeen were selected for use. This section describes the scales selected and the rationale underlying the selection of each scale.

All of the instruments except the self-efficacy scale (Sherer et al., 1982) met the first set of criteria (see Table 1). Data used in the initial development of this instrument were drawn from students in a college-level psychology class, not individuals working in organizations. For our purposes, this was not ideal, to the extent we were looking for instruments that evidenced some generalizability to organizational setting, However, given the nature of the construct, self-efficacy, which examines an individual's past experiences with success and failure in a variety of situations, including work situations; the apparent relatedness of the scales items to LTSI 15: Performance Self-Efficacy; and the fact that two sets of factor analysis data were collected to verify factor structure, the instrument was determined appropriate for the study. In addition, another study during the developmental process (Sherer et al., 1982) included a sample similar to that of the LTSI.

Second, the instruments in this study were rated based on the components of the instrument evaluation model (Robinson et al., 1991). Because many studies have not used psychometrically valid measurements, only two of the comparison measures, the Job Descriptive Index and KEYS Environment Scale, met to some degree each of the eight criteria of the model. In this rating

methodology, three of the instruments were rated in the moderate category: Leader Reward Behavior Scale, Work Related Expectancies Scale, and Manifest Need Questionnaire. The remaining fourteen instruments received ratings in the "extensive" category for evaluating instruments. Each of the instruments and selected scales is described next.

Work Environment Scale. The Work Environment Scale (WES; Moos, 1994) is a ninety-item instrument developed to measure the social environment of work settings along three broad dimensions (relationships, personal growth, and systems maintenance and change) assessed by ten scales. The format for the WES requires true-false responses to each statement.

Moos (1994) used a sample of 1,045 employees (retail food industry, office managers, clerical workers, radio station workers, employees in education, and health care workers) to examine internal consistency reliabilities for the ten scales. The results indicated that reliability scores were in an acceptable range (involvement, $\alpha = .84$; coworker cohesion, $\alpha = .69$; supervisor support, $\alpha = .77$; autonomy, $\alpha = .73$; task orientation, $\alpha = .76$; work pressure, $\alpha = .80$; clarity, $\alpha = .79$; managerial control, $\alpha = .76$; innovation, $\alpha = .86$; and physical comfort, $\alpha = .81$).

Three WES scales were used in this study. The Coworker Cohesion scale of WES was used as a comparison measure with LTSI 6: Peer Support, because both scales examined interaction among coworkers. The Work Pressure scale of WES was compared to the LTSI 5: Personal Capacity for Transfer, because both measures addressed time as it related to the demands of the job. Finally, the Managerial Control scale was correlated with the LTSI 4: Personal Outcomes—Negative, because both assessed perceived managerial impact on employee performance.

Job Descriptive Index. Based on job satisfaction theory, the Job Descriptive Index (JDI; Smith, Kendall, & Hulin, 1969) was developed to assess an individual's job satisfaction. It consists of ninety items with five scales intended to reflect the idea that job satisfaction factors (work, pay, promotion, supervision, and coworkers) are principal components in worker motivation and behavior (Balzer et al., 1997). The JDI was revised in 1985 to accommodate workplace changes but still assessed the five original constructs.

A random sampling procedure, stratified by state population, was used to establish normative data for the JDI (Smith-Jentsch, Jentsch, Payne, & Salas, 1996). A sample of working individuals was obtained from the 1990 U.S. Census and social security database. Internal reliability estimates for each of the five scales were calculated with the sixteen hundred cases from the national norm database. Cronbach's alpha coefficient estimates of reliability for each of the scales were as follows: Work = .90; Pay = .86; Opportunities for Promotion = .87; Supervision = .91; and Co-workers = .91.

Two comparison scales were selected from the JDI. The Opportunity for Promotion was compared with the LTSI 3: Personal Outcomes—Positive,

because both scales address employee expectations of rewards from their employer. The Supervision scale was compared with LTSI 7: Supervisor Support, because both scales address a supervisor's impact on employee job performance.

KEYS Environmental Scales. KEYS Environmental Scales (KEYS; Amabile, Burnside, & Gryskiewicz, 1995) was developed to assess perceived stimulants and obstacles to creativity in organizational work environments. It is based on creativity and innovation theory and sees three general organization components (organizational motivation to innovate, resources, and management practices) as key in the innovation process. KEYS comprises seventy-eight items with ten scales that focus on stimulants to creativity, obstacles to creativity, and outcomes. It uses a four-point, Likert-type response scale.

Validation studies of KEYS were conducted using 12,525 respondents (Amabile, 1988; Amabile, Gryskiewicz, Burnside, & Koester, 1990). The respondents represented employees in a variety of functions and departments from over twenty-six organizations (industrial, high technology, biotechnology, electronics, health, and pharmaceutical products). The findings showed that KEYS had "an acceptable factor structure; the median scale reliability was .84; all items correlated more strongly with their own scale than they did with any other scale; and test-retest reliability over a three month period was above .70" (Amabile et al., 1990, p. 26). Correlation studies comparing KEYS with the Work Preference Inventory, a personality measure of motivational orientation, and the Kirton-Adaption-Innovation Inventory, a cognitive style measure, showed relatively low correlations, suggesting divergent validity and "that respondents' rating of their work environment are not merely reflections of their own personal characteristics" (Amabile et al., 1990, p. 26). KEYS correlated only moderately with the WES, indicating that the measures assess different aspects of the work environment.

Two KEYS scales were selected as comparison measures in our study: Supervisory Encouragement of Creativity and Work Group Support. The Supervisory Encouragement of Creativity scale was used as a comparison to LTSI 7: Supervisor Support, because both appear to address the effect of supervisors' management styles on employee performance. The Work Group Support scale was correlated with LTSI 14: Resistance to Change, because both scales address aspects of group support for change.

Perceived Work Environment. Perceived Work Environment (PWE; Newman, 1977) was developed as a comprehensive measure of employee perceptions of the work environment. It was designed to assess the state of a given work environment and evaluate the effect of programs aimed at modifying organized work environments (Newman, 1977). The PWE consists of sixty items with eleven scales and is formatted on a five-point Likert scale (never true, almost never true, sometimes true, almost always true, and always true).

Validation data for the PWE are based on five studies conducted with samples representing a diversity of organizational levels and functional

departments (executive, accounting, personnel, records, administration services, underwriting, claims, and policyholder services). The initial study used a sample of 710 employees from a Midwest regional office of a large multiline insurance company. The results indicated acceptable levels of reliability (median range .71) for all of the scales with the exception of the job responsibility/importance scale. The reliability scores were similar in the four replication studies, indicating the same underlying dimensional structure (Newman, 1977). A comparison of the factor solutions from the five data collections reported that the factor congruence coefficients for the eleven-factor structure ranged from .45 to .95, with a median of .82. The PWE was correlated with the Job in General scale (Smith et al., 1969) with coefficients ranging from .10 to .40, indicating that the PWE scales "are not just another measure of job satisfaction" (Newman, 1977, p. 529).

Five PWE scales were used in this study: Employee Competence, Employee Work Motivation, Coworker Relations, Task Characteristics and Pressure to Produce. Employee Competence was correlated with the LTSI 1: Learner Readiness scale, because both examined employee readiness. Employee Work Motivation was compared with the LTSI 2: Motivation to Transfer, because both scales address dimensions of employee motivation. Coworker Relations was correlated with the LTSI 6: Peer Support, because both examined how employees interact with each other. Task Characteristics was compared to LTSI 11: Opportunity to Use Learning, because both scales addressed characteristics of employee job tasks. Pressure to Produce was compared to LTSI 5: Personal Capacity for Transfer, because both scales examined work pressure on the job.

Internal Work Motivation Scale. The Internal Work Motivation Scale (IWMS; Hackman & Oldham, 1975), based on work redesign theory, was constructed to assess the degree to which employees are self-motivated to perform effectively. IWMS is a six-item scale with a seven-point Likert response format.

A validation study (Hackman & Oldham, 1975) using 658 employees in seven organizations reported a Spearman-Brown internal reliability coefficient of .76. Within this sample, the IWMS measure was correlated with the General Job Satisfaction scale ($r = .51$), the Growth Satisfaction scale ($r = .56$), and the Experience Meaningfulness of Work scale ($r = .66$).

The Internal Work Motivation Scale was compared to LTSI 2: Motivation to Transfer scale, on the basis that both measures examined motivational factors affecting employee job performance.

Index of Organizational Reactions. The Index of Organizational Reactions (IOR; Smith, 1976), based in job satisfaction theory, was developed to measure multiple facets of employee job satisfaction and perceived relationships between job features and work performance (Smith, 1976). The IOR comprises forty-two items with eight scales and has been used with either five- or six-point, Likert-type response scales.

Validation studies (Smith, 1976) were conducted using five samples made up of 12,971 employees from numerous locations, work functions, and departments within Sears, Roebuck and Company. In this study, the IOR scales showed acceptable internal reliability estimates: supervision, $\alpha = .90$; company identification, $\alpha = .82$; kind of work, $\alpha = .89$; amount of work, $\alpha = .77$; coworkers, $\alpha = .77$; physical conditions, $\alpha = .90$; financial rewards, $\alpha = .85$; and career future, $\alpha = .83$. Principal component factor analysis produced virtually identical factor structures across five samples of workers in studies conducted over a three-year period.

The Financial Elements and Supervision scales of the IOR were used in this study. The Financial Elements scale was used as a comparison scale for LTSI 3: Personal Outcomes–Positive, because both scales addressed employee expectations for rewards. The IOR Supervision scale was compared to LTSI 8: Supervisor Sanctions, because both scales tap perceptions about how negative reactions from supervisors influence employee job performance.

Leader Reward Behavior Scale. The Leader Reward Behavior Scale (LRBS; Sims & Szilagyi, 1975) was drawn from leadership theory and was designed to measure the extent to which a subordinate perceives that positive or negative rewards received through his or her supervisor reflect his or her job performance. It contains two scales: Positive Reward Behavior and Punitive Reward Behavior. The LRBS uses a seven-point, Likert-type response scale.

Internal reliability estimates, based on data from 630 paramedical and support personnel in a university medical center, for the two scales were acceptable: .93 for Positive Reward Behavior and .70 for Punitive Reward Behavior (Sims & Szilagyi, 1975). Factor analysis of data from 192 managerial, engineering, and supervisory manufacturing employees confirmed the two-factor structure of the LRBS, with congruency coefficients of .95 for Positive Reward Behavior and .91 for Punitive Reward Behavior. Spearman-Brown internal reliabilities were .92 and .88, respectively (Keller & Szilagyi, 1978).

Our study used the Punitive Reward Behavior scale as a comparison for LTSI 8: Supervisor Sanctions. Both scales examine the effect of perceived negative supervisor actions (or reactions) on employee job performance.

Facet-Specific Job Satisfaction. The Facet-Specific Job Satisfaction (FSJS; Quinn & Staines, 1979) was designed to measure a worker's evaluation of his or her job. The instrument contains thirty-three items measuring six scales. The conceptual framework is based in job satisfaction theory.

A validation study by Quinn and Staines (1979) used a sample of 1,515 respondents designed to be representative of all employed adults, industries, and occupations in the United States. Initial evidence of the validity of the six-factor structure was derived through factor analysis. Subsequent reliability estimates for the scales included comfort ($\alpha = .69$), challenge ($\alpha = .88$), financial rewards ($\alpha = .66$), relations with coworkers ($\alpha = .61$), resource adequacy ($\alpha = .88$), and promotions ($\alpha = .76$).

The Resource Adequacy scale was included in this study. This scale was compared with LTSI 11: Opportunity to Use Learning scale, because both measures tap employees' perceived access to work-related resources.

Work-Related Expectancies Scale. Based on expectancy theory, the Work-Related Expectancies Scale (WRES; Sims, Szilagyi, & McKenney, 1976) was designed to measure employees' perceived outcomes from working hard. The instrument contains twenty-six items measuring two work-related expectancy scales: effort-performance expectancy and performance-reward expectancy. WRES responses are formatted on a seven-point, Likert-type scale.

Factor analysis of data from 931 university medical center employees in five occupational categories confirmed the two principal factors and provided evidence of the stability of the factor structure across the occupational groups. Congruency coefficients ranged from .99 to .96 for effort-performance expectancy and .91 to .97 for performance-reward expectancy. The Spearman-Brown internal reliability coefficients were .87 and .94, respectively. Similar reliability estimates were reported by Keller and Szilagyi (1978).

Both the Effort-Performance Expectancy and Performance-Reward Expectancy scales of the WRES were used in this study. They were correlated with the LTSI 12: Transfer Effort-Performance Expectations, and the LTSI 13: Performance Outcomes Expectations, respectively. The Effort-Performance Expectancy and the LTSI 12 scale comparison was made because both scales tapped effort-based performance expectations. The Performance Reward Expectancy and LTSI 13 scale comparison was made because both scales addressed employee perceived outcomes for quality performance.

Manifest Needs Questionnaire. The Manifest Needs Questionnaire (MNQ; Steers & Braunstein, 1976) is based on need theories of motivation (Alderfer, 1969; Maslow, 1943) and was designed to measure four work-related needs (achievement, affiliation, autonomy, dominance) using twenty items and a seven-point, Likert-type response scale.

In a test of the MNQ, Steers and Braunstein (1976) studied ninety-six management students employed in various jobs. Reliability estimates were generally acceptable: achievement (α =.66, test-retest correlation over a two-week period was .71); affiliation (α = .76, test-retest correlation coefficient = .75); autonomy (α = .61, test-retest correlation = .77); and dominance (α = .83, test-retest correlation = .77).

The need-for-achievement scale from the MNQ was used in this study as a comparison for LTSI 12: Transfer Effort–Performance Expectations. Both scales address an aspect of employee-initiated effort as it relates to job performance.

Self-Efficacy Scale. The Self-Efficacy Scale (SES; Sherer et al., 1982) was developed to measure a person's general efficacy beliefs about his or her ability to perform. The conceptual base for the SES is self-efficacy theory, which asserts that personal mastery expectations are a primary determinant of behavioral change. It suggests that two types of expectancies exert

powerful influence on behavior (Maddox, Sherer, & Rogers, 1982): outcome expectancies (the belief that certain behaviors will lead to certain outcomes) and self-efficacy expectancies (the belief or expectation that one can successfully perform the behavior in question). The SES contains two scales formatted on a four-point, Likert-type scale.

Sherer et al. (1982) conducted a validation study using a sample of 376 students in an introductory psychology course. Factor analysis yielded two scales: generalized self-efficacy (seventeen items) and social self-efficacy (seven items). To confirm the original factor structure, a second study (Sherer et al., 1982) was conducted using a sample of 298 student enrolled in psychology classes. The results of this factor analysis replicated the original two-factor structure. Cronbach alpha reliability coefficients obtained for the General and Social scales were .86 and .71, respectively.

The General Self-Efficacy scale is included in this study. This scale was compared to the LTSI 15: Performance Self-Efficacy, because both assess aspects of employees' belief in their ability to perform the job.

Critical Psychological States. Critical Psychological States (CPS; Hackman & Oldham, 1975) was developed to measure the experienced psychological states of individuals. The CPS is based on work redesign theory and research suggesting that an employee's psychological state mediates the relationship between job characteristics and an employee's reaction to the job. The CPS was designed to assess three factors (meaningfulness of work, responsibility for work outcomes, and knowledge of results) using a seven-point, Likert-type response scale.

A validation study (Oldham, Hackman, & Stepina, 1978) using a sample of 6,930 employees working in 876 jobs in 56 organizations reported acceptable reliability estimates for meaningfulness of the work ($\alpha = .71$), responsibility for work outcomes ($\alpha = .67$), and knowledge of results ($\alpha = 71$). The three scales of the CPS were correlated with General Job Satisfaction ($r = .63$, .66, and .25, respectively) and the Growth Satisfaction Scale ($r = .68$, .54, and .36, respectively).

The Responsibility for Work Outcomes scale was used in this study as a comparison scale for LTSI 13: Performance–Outcomes Expectations. Both scales addressed distinct dimensions of performance-related outcomes.

Group Process Scale The Group Process Scale (GPS; Taylor & Bowers, 1972) is based on a systems approach to organizational development and was developed to provide a standard measure of the interpersonal processes and functioning of work groups. Responses to the seven items on the GPS are made using a five-point, Likert-type response scale.

Hierarchical cluster analysis of data from 754 work groups (Taylor & Bowers, 1972) supported the use of the seven-item GPS measure as a single index ($\alpha = .96$) that did not correlate highly with either satisfaction with work group or work group effectiveness scales. In our study, the GPS was correlated

with LTSI 14: Resistance to Change scale. Both scales addressed distinct factors influencing the relationship between group interaction and job performance.

Job Dimensions Scale. The Job Dimensions Scale (JDS; Hackman & Lawler, 1971) was based on job design theory that says that employee motivation increases to the extent it provides opportunities for achievement, recognition, responsibility, advancement, or growth in competence. The seventeen-item JDS was developed to examine employees' perceptions of six job dimensions (skill variety, autonomy, task identity, feedback, dealing with others, and friendship opportunity) thought to be principal influences on employee attitudes and behaviors. Responses to the JDS are made using a seven-point, Likert-type scale.

Hackman and Lawler (1971) conducted a study using the JDS with 270 telephone company employees in thirteen jobs. Analysis yielded the following internal reliability estimates: skill variety, $\alpha = .90$; autonomy, $\alpha = .77$; task identity, $\alpha = .77$; feedback, $\alpha = .75$; dealing with others, $\alpha = .59$; and friendship opportunity, $\alpha = .43$.

The Feedback scale from the JDS was selected as a comparison for LTSI 16: Feedback/Performance Coaching because both address the impact of feedback on employee performance.

Mastery Scale. The Mastery Scale (Pearlin, Lieberman, & Mullan, 1981) was designed to measure the "extent to which one regards one's life chances as being under one's own control in contrast to being fatalistically ruled" (p. 304). Stress theory suggests that life events can lead to negative changes in people's roles that wear away at desirable elements of self-concept, resulting in arousal of stress. The Mastery Scale was developed as part of a larger investigation into the social origins of personal stress. The seven-item scale is formatted on a four-point, Likert-type scale.

Factor analysis of data collected in 1972 and 1973 from twenty-three hundred males and females in households selected through cluster sampling provided evidence of the construct validity of the mastery scale. A second set of data collected about one year later from 1,106 of the original respondents produced similar results, suggesting the relationship between constructs and indicators remained stable over time (Pearlin et al., 1981).

The Mastery scale and the LTSI 15: Performance Self-Efficacy scale comparison was included in this study, because both examine employees' perceptions of their abilities.

Task-Goal Attributes. The Task-Goal Attributes (TGA; Steers, 1975) was designed to measure the impact of setting clear goals on task performance. The TGA's theoretical basis is goal-setting theory, which suggests that "the act of setting clear goals in an individual's job generally results in better task performance than not setting such goals" (Steers, 1975, p. 392). The instrument contains sixteen items measuring five scales. Responses are made along a seven-point, Likert-type scale.

Factor analysis of data collected with the TGA has yielded a five-factor structure explaining 66.1 percent of common variance (Steers, 1975). Subsequent research suggests the scales have adequate reliability estimates: participation in goal setting, $\alpha = .72$; feedback on goal effort, $\alpha = .81$; peer competition, $\alpha = .69$; and goal difficulty, $\alpha = .72$ (Steers & Braunstein, 1976).

Two scales from the TGA were used in this study. Participation in Goal Setting was compared to LTSI 1: Learner Readiness, because both scales examined employee input into defining organizational outcomes through goal setting. The Feedback on Goal Effort scale was compared to the LTSI 16: Performance Coaching, because both scales address feedback on job performance.

Alienation from Work Scale. The Alienation from Work Scale (AFWS; Shepard, 1972) was developed to operationalize five aspects of individual social psychological separation from some social referent (Shepard, 1972). The scale is based in alienation theory, which assumes that the larger society is the social referent from which alienation is measured. The AFWS consists of thirty items designed to operationalize five aspects of work-related social referent.

A validation study (Shepard, 1972) with 305 production workers (operators, maintenance craftsmen, assembly-line workers, and maintenance journeymen) revealed item total correlations ranging from .49 to .63 for powerlessness, .35 to .70 for meaninglessness, .50 to .65 for normlessness, .38 to .48 for instrumental work orientation, and .29 to .49 for self-evaluative involvement. Powerlessness, normlessness, and meaninglessness have been correlated with employee tardiness at work and employee work effort (Cummings & Manring, 1977).

The Normlessness scale was used in this study as a comparison for LTSI 4: Personal Outcomes–Negative, because both measures address employee perceptions of negative personal outcomes.

Excluded LTSI Scales. Two LTSI scales, LTSI 9: Content Validity and LTSI 10: Transfer Design, appear to measure constructs so unique to training transfer that no suitable comparison measures could be located. Thus, only fourteen of the sixteen LTSI factors were included in the convergent-divergent analysis (research question 2). The comparison measures for each of the fourteen LTSI factors used in the study are summarized in Table 3.

Research Question 2: Associations Between the LTSI Scales and the Comparison Measures. This section reports the results of the correlation analysis between the LTSI scales and selected comparison measures.

PANAS Results. The PANAS instrument was used to assess the degree of mood change that occurred during training. From the beginning to the end of training, there was a nonsignificant mean increase for both the positive affect scale ($M = 3.49$ and 3.53) and the negative affect scale ($M = 1.49$ and 1.41). These scores suggest there was no substantial change in respondents' positive and negative affectivity from the beginning to the end of the training sessions.

Table 3. Comparison Scales Used in This Study

	LTSI Scales															
Comparison Instruments	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1. WES				X	X	X	X									
2. KEYS							X							X		
3. PWE	X	X			X	X					X					
4. IOR			X					X								
5. JDI			X				X									
6. AFWS				X												
7. TGA	X															X
8. LRBS								X								
9. FSJS											X					
10. WRES												X	X			
11. GPS														X		
12. SES															X	
13. MS															X	
14. JDS																X
15. IWMS	X															
16. MNQ												X				
17. CPS													X			

Note: Comparison instruments: (1) Work Environment Scale, (2) KEYS Environmental Scale, (3) Perceived Work Environment, (4) Index of Organizational Reaction, (5) Job Descriptive Index, (6) Alienation from Work Scale, (7) Task-Goal Attribute Scale, (8) Leader Reward Behavior Scale, (9) Facet-Specific Job Satisfaction, (10) Work-Related Expectancy Scale, (11) Group Process Scale, (12) Self-Efficacy Scale, (13) Mastery Scale, (14) Job Dimensions Scale, (15) Internal Work Motivation Scale, (16) Manifest Needs Questionnaire, (17) Critical Psychologist States Scale.

LTSI scales: (1) Learner Readiness, (2) Motivation to Transfer, (3) Personal Outcomes–Positive, (4) Personal Outcomes–Negative, (5) Personal Capacity for Transfer, (6) Peer Support, (7) Supervisor/Manager Support, (8) Supervisor/Manager Sanctions, (9) Perceived Content Validity, (10) Transfer Design, (11) Opportunity to Use Learning, (12) Transfer Effort–Performance Expectations, (13) Performance Outcomes–Expectations, (14) Resistance to Change, (15) Performance Self-Efficacy, (16) Performance Coaching.

Examining the Factor Structure of the LTSI. An exploratory factor analysis was conducted on the LTSI responses to assess whether substantial differences in factor structure existed between the sample in this study and that used to develop the instrument. Common factor analysis with oblique rotation (direct oblimin) was used because that was the procedure used by the instrument authors (Holton et al., 2000). The results showed that the factor structure in these data was almost identical, with all items loading at .30 or higher and most loading at .40 or higher. For training-specific factors, two items from LTSI 11: Opportunity to Use Learning loaded more heavily on LTSI 9: Content Validity, though at a low level. For general factors, one item from LTSI 16: Performance Coaching loaded with LTSI 13: Performance Outcome–Expectations, again at a low level. These differences are considered to be within the range of sample specific variations, especially for a relatively new instrument such as the LTSI.

Table 4. Correlations and Partial Correlations Examining the Nomological Network of the LTSI Factors with All of the Comparison Measures

	Training-Specific LTSI Factors									*General Transfer LTSI Factors*				
Comparison Measures	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*11*	*12*	*13*	*14*	*15*	*16*
1. IWMS	.22	**.31**				.21		**−.27**	.25	.31			.22	
2. LRBP				.32				**−.01**						
3. TGAF							.40				.30			**.28**
4. SES		.26								.27			**.27**	
5. TGAG	**.10**						.31				.36			.21
6. AFWS			.27	**.05**		.20	.31			.41				.21
7. CPS		.34			.22	.24			.24	.38	**.27**	**−.29**	.27	
8. MNQ										**.28**			.34	
9. WRESE					.25				.20	**.28**	.23		.32	
10. WRESR		.24	.33			.29	.39			.37	**.60**	**−.23**	.22	.38
11. JDS						.22	.46				.35			**.33**
12. IORF		**−.30**	**−.09**		**−.20**	−.21	−.24		−.25	−.23				
13. IORS						.25	.44	**−.18**	.20	.23	.43	**−.22**		.26
14. FSJS		.20				.30	.37	**−.25**	**.25**	.32	.43	**−.31**		.23
15. MAST		.20								.30	.28		**.20**	
16. JDIO		.24	**.25**			.22	.22			.25	.37	**−.21**	.23	

17. JDIS						.30	**.39**			.23	.35			
18. KEYSW		.23				.30				.27		**−.44**	.21	
19. KEYSS						.30	**.45**	**−.23**		.24	.46	**−.23**		.25
20. GPS						.44	.28	**−.23**	.25	.34	.39	**−.51**	.22	.34
21. PWEP					**−.16**	.24								.22
22. PWEC		.20			.25	**.38**	.25		.20	.33	.37	**−.49**	.21	.29
23. PWET		.21	.22			.36	.33		**.18**	.36	.47	**−.32**	.27	.39
24. PWEE	**.01**					.27								
25. PWEM		**.27**	.30		.25	.46	.39		.23	.51	.45	**−.42**	.31	.45
26. WESM			.26	**.24**		.29					.23	**−.20**		.24
27. WESW				.24	**−.40**									
28. WESC					.23	**.33**	.26		.21	.23	.24	**−.35**		.20

Note: Correlations in bold represent the twenty-eight planned comparisons with the LTSI.

LTSI scales: (1) Learner Readiness, (2) Motivation to Transfer, (3) Personal Outcomes–Positive, (4) Personal Outcomes–Negative, (5) Personal Capacity to Transfer, (6) Peer Support, (7) Supervisor/Manager Support, (8) Supervisor/Manager Sanctions, (9) Perceived Content Validity, (10) Transfer Design, (11) Opportunity to Use Learning, (12) Transfer Effort–Performance Expectations, (13) Performance Outcomes–Expectations, (14) Resistance to Change, (15) Performance Self-Efficacy, (16) Performance Coaching.

Comparison measures (an asterisk signifies partial correlations): (1) IWMS: Internal Work Motivation*; (2) LBRP: Punitive Reward Behavior*; (3) TGAF: Feedback on Goal Setting*; (4) SES: General Self-Efficacy*; (5) TGAG: Participation in Goal Setting; (6) AFWS: Normlessness*; (7) CPS: Experienced Responsibilities for Work Outcomes*; (8) MNQ: Need for Achievement*; (9) WRESE: Effort Performance Expectancy*; (10) WRESR: Performance Reward Expectancy*; (11) JDS: Feedback*; (12) IORF: Financial Element*; (13) IORS: Supervision*; (14) FSJS: Resource Adequacy*; (15) MAST: Mastery Scale*; (16) JDIO: Opportunity for Promotion*; (17) JDIS: Supervision; (18) KEYSW: Work Group Support*; (19) KEYSS: Supervisory Encouragement*; (20) GPS: Group Process Scale; (21) PWEP: Pressure to Produce; (22) PWEC: Coworker relations; (23) PWET: Task Characteristics; (24) PWEE: Employee Competence; (25) PWEM: Motivation to Transfer; (26) WESM: Managerial Control; (27) WESW: Work Pressure; (28) WESC: Coworker Cohesion.

Planned Comparisons with LTSI Scales. The correlation analysis was conducted in two parts to assess the convergent and divergent validity of the LTSI. First, the correlations between each LTSI scale and its two planned comparison measures selected were examined. These are shown in Table 4 by the correlations in bold type. For these planned comparisons, the *r* value is shown regardless of its size.

The following list summarizes the results of the comparisons using the criteria specified in the methodology section for classifying correlations:

- Eight of the twenty-eight comparisons fell into the negligible range (.00 to .19).
- Eighteen of the twenty-eight comparisons fell into the low range (.20 to .49).
- Only two of the twenty-eight comparisons fell into the moderate range (.50 to .69), and both of these were for General LTSI factors, where a higher correlation is not surprising.

Results show that twenty-six of the twenty-eight planned correlations (92.8 percent) were in the negligible or low range. All of the nine training-specific scale correlations fell in this range. Of the ten correlations examined for the five training-in-general scales, eight fell in the negligible or low range. Two of the general scales had moderate correlations: LTSI 13: Performance–Outcome Expectations and LTSI 14: Resistance to Change were correlated with WRES: Performance Reward Expectancy and Group Process Scale, $r = .60$ and $-.51$, respectively. Moderate correlations such as these suggest these scales are measuring similar but nevertheless distinct constructs.

Other Comparisons. In a second analysis, the correlations between the LTSI scales and all of the other comparison measures were evaluated. The purpose of this exploratory analysis was to begin to gather information about the nomological network for the LTSI constructs. Although the original matched comparisons were of greatest interest, it was logical to examine all of the correlations in case there were other associations that might not have been anticipated. The remaining correlations (those not in bold type in Table 4) show only correlations of .20 and above. Negligible correlation coefficients ($r = .00$ to .19) are not shown in the table for clarity and because the sample did not have adequate statistical power to detect their significance.

There are four key observations about these unplanned comparisons. First, the results show that a large number of comparison measures used in this study were correlated with the LTSI scales. This is not surprising since the comparison measures themselves likely have some degree of correlation. Second, for ten of the scales, at least one of the unplanned comparisons resulted in a correlation that was higher than the highest planned comparison correlation. However, the third observation is that these differences were generally small and for nine of the scales did not change the category describing the degree of correlation. For example, if the planned comparisons resulted

in a low correlation, the unplanned comparisons fell into the same category even if the unplanned correlation was slightly higher. The final observation is that there was one scale in which the category did change. For LTSI 12: Transfer Effort–Performance Expectation, the highest planned comparison was $r = .28$, placing it in the low category of association. However, the unplanned comparisons showed that that scale's correlation with PWEM: Motivation to Transfer was .51, which places it in the moderate category,

Overall the results still show a high degree of divergence. Although many additional associations were found when examining the full set of comparison measures, including some with stronger associations than the planned comparison scales, none were substantially different enough to change the overall finding of divergence.

Conclusion

The conceptualization and measurement of climates and systems related to learning transfer have important implications for improving training outcomes in organizations and training research. Transfer climate variables have implications for nearly every aspect of training, from the identification of needs to design, delivery, and ultimately application of new learning on the job. Most training researchers acknowledge the importance of transfer climate variables and agree that such a climate is composed on multiple dimensions. As we noted earlier, however, the measurement and validation of these dimensions is another issue. Venkatraman and Grant (1986) note that the systematic evaluation of the construct validity of measures is vital for building a strong basis for interpreting research in organizational research.

The goal of this study was to advance the construct validation of an important new instrument, the LTSI. Correlation analysis was used to examine the convergent and divergent validity of fourteen of the sixteen LTSI scales. The most interesting finding from this study was the relatively low correlations between the LTSI scales and the comparison scales, suggesting the LTSI scales have little overlap with other related measures. The clear implication is that the LTSI measures unique constructs with the potential to add significantly to our understanding of learning transfer climates and systems in organizations.

Currently a wide variety of interventions are used in organizations to positively influence transfer climate factors; among them are peer support, supervisor or manager support, perceived content validity, and transfer design. From a practical standpoint, the development of standard instruments to measure climate across many types of organizations is imperative. A psychometrically valid instrument could serve as a starting point for identifying transfer factor problems. Use of generalized instrumentation would not preclude the use of situation-specific scales as determined necessary by the organization of HRD professional (safety related and product specific). Instead,

it could serve as a foundation of validated constructs with established applicability across organizational settings.

From a theoretical standpoint, the results of this study and the other validation studies identified above address several critical problems with transfer research, as noted by Baldwin and Ford (1988). Many researchers generalize their studies to other samples using minimally validated instruments, as evidenced in the studies identified by Baldwin and Ford (1988) and Ford and Weissbein (1997). Validated learning transfer instruments are critical in learning transfer research. The LTSI instrument provides the most comprehensive and most extensively validated instrument to assess dimensions of the learning transfer climate that has been developed to date.

Implications for Practice. The LTSI has application far beyond the research community. We suggested at the beginning of this article that organizations should be working to understand the transfer system and intervene to eliminate barriers that inhibit transfer. Our goal has been to develop an instrument that is both validated for research purposes and useful for practice. Thus, the LTSI potentially provides a sounder diagnostic inventory to identify targets for organizational interventions.

Our experience is that the LTSI is best used as a pulse-taking diagnostic tool in an action research (Cummings & Worley, 2005) approach to organization development. That is, the LTSI's primary benefit is to identify problem areas. After pinpointing factors that are potential barriers within the transfer system, follow-up focus groups and interviews with appropriate employees are then used to help understand the meaning of the findings. For example, suppose scores on the supervisor support scale are low. Focus groups would reveal what specific types of support are missing and what employees would like supervisors to do, and possibly provide insights into the reasons supervisors are not providing support.

Participants can then be engaged in a collaborative action planning strategy to enhance transfer of learning. Interventions might include team building (if peer support is low), supervisor training (if supervisor support is low), getting trainees more involved in training design (if transfer design or content validity is low), providing greater recognition for use of new skills (if positive personal outcomes is low), or increasing feedback (if performance coaching is low). This short list of examples emphasizes our point that a psychometrically sound diagnostic tool is vitally important for practitioners as well. When one considers the wide range of interventions that an organization might undertake to influence the transfer system, it is clear that it would be easy for the wrong intervention to be chosen without sound diagnostic data.

This emphasizes the importance of using the LTSI as a starting point for collaborative planning with affected employees. There is increasing evidence that transfer of learning can be enhanced by interventions (Broad, 1997). Traditionally transfer of learning has been more a matter of study and research than intervention. In today's knowledge economy, transfer of learning is

necessary to build intellectual capital in organizations. It follows that measurement tools such as the LTSI have to move out of the research domain into practical use and that interventions must be developed to respond to problems it identifies.

Implications for Research. Like all other research in the social sciences, construct validation is an ongoing process. Although this study provided some initial evidence of the convergent and divergent validity of the LTSI scales, additional work is needed to more fully understand the psychometric qualities of these scales. A more rigorous test of the convergent and divergent validity of the LTSI scales would be through the use of the multitrait-multimethod matrix. The basic procedure is described by Campbell and Fiske (1959), and a more robust approach incorporating confirmatory factor-analytic techniques is described by Kenny and Kashy (1992).

In addition, cross-validation studies of the LTSI factors are needed to examine factor stability in different types of organizations and training interventions. In the original developmental studies of the LTSI, a broad sample of federal, state, and municipal government agency employees, as well as employees in industrial and technical organizations, was used. In an effort to make the LTSI more broadly applicable, studies using the instrument in other organizations and contexts are needed to confirm that the scales are stable and operate as expected across a diversity of venues.

Cross-cultural construct validation studies using the LTSI are also needed to determine whether the factor structure obtained from U.S. samples is similarly valid with samples from other countries. Cross-cultural studies could help to determine the international applicability of the LTSI instrument. Along similar lines, it would be appropriate to examine the factor structure of the LTSI in samples of African American, European American, and Hispanic American employees in the United States to examine the potential impact of ethnic differences in organizations.

Future validation research should move beyond construct validity to establish further criterion validity by using the instrument to estimate some criterion behavior that is external to the instrument itself. Nomological validity also incorporates the degree to which predictions from a formal theoretical network containing the concept under scrutiny are confirmed. Criterion validity studies to determine the degree to which the LTSI constructs can predict performance outcomes in the workplace are the next major step in this ongoing validation process. For example, the Bates, Holton, Seyler, and Carvalho (2000) study used an early version of the LTSI to predict supervisor performance ratings. Further research of this type is needed to examine the criterion validity for each factor of the LTSI using the latest version of the instrument. The authors of the LTSI have also "tied specific knowledge, skill, and ability elements with the 16 LTSI constructs" (Holton et al., 2000, p. 24). Further investigation and operationalization of these knowledge, skill, and ability elements would enable researchers to examine criterion validation through experimental manipulation of the factors.

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