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**AN ANALYSIS OF THE FACTORS AFFECTING TRAINING TRANSFER  
WITHIN THE WORK ENVIRONMENT**

THESIS

Daniel J. Williams, MSgt, USAF

AFIT/GIR/ENV/08-M25

**DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY**

**AIR FORCE INSTITUTE OF TECHNOLOGY**

**Wright-Patterson Air Force Base, Ohio**

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AFIT/GIR/ENV/08-M25

AN ANALYSIS OF THE FACTORS AFFECTING TRAINING TRANSFER WITHIN  
THE WORK ENVIRONMENT

THESIS

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In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Information Resource Management

Daniel J. Williams

Master Sergeant, USAF

March 2008

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AN ANALYSIS OF THE FACTORS AFFECTING TRAINING TRANSFER WITHIN  
THE WORK ENVIRONMENT

Daniel J. Williams  
Master Sergeant, USAF

Approved:

//signed//  
Michael T. Rehg, (Chairman)

29 February 2008  
Date

//signed//  
Daniel T. Holt, Lt Col, USAF (Member)

29 February 2008  
Date

### **Abstract**

A meta-analysis of 34 studies was performed to explore the magnitude in which work environment manipulates training transfer. The independent variables for this study included supervisor support, subordinate support, peer support, transfer climate, relapse prevention, goal setting, continuous learning culture, task constraints, and frequency of use. These variables were analyzed independently to compare their correlation to training transfer. These variables were also combined together (minus goal setting and relapse prevention) into a group called environmental support to compare overall organizational support to goal setting and relapse prevention. Finally, this study performed a moderator analysis to compare the effect these independent variables had on management and non-management training; and self-reporting versus supervisor or peer reporting; and training versus development. Results revealed that relapse prevention (.65) had the highest levels of correlation of all independent variables to training transfer. The results also showed that managerial training (.32) had higher levels of correlation to training transfer as compared to non-managerial training (.20). Self-reporting (.28) showed higher levels of training transfer than did supervisor or peer reporting (.16). Training (.30) showed higher levels of training transfer compared to development (.16). Finally, limitations and future research are discussed.

## Acknowledgments

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# AN ANALYSIS OF THE FACTORS AFFECTING TRAINING TRANSFER WITHIN THE WORK ENVIRONMENT

## I. Introduction

### Overview

The skills and performance of employees in the workplace are critical to the success of every organization. Many organizations spend an immense sum of money on training, believing that training will improve their employees' performance and enhance the firm's productivity (Yamhill, 2001). Many billions of dollars are being spent annually on training (Holton, Ruona, & Leimbach, 1998) and employers are now questioning the return on their investment.

Transfer of training, the degree to which trainees apply to their jobs the knowledge, skills, and behaviors learned in training, is now widely acknowledged to be the paramount concern of organizational training initiatives (Baldwin & Ford, 1988; Tannenbaum & Yukl, 1992). Persistently low estimates of the application rates generated from corporate training expenditures suggest that, despite an explosion of literature attention to transfer in recent years, the "training problem" remains acute (Anthony & Norton, 1991; Garavaglia, 1993). Estimates suggest a low return on the investment in training overall. Unfortunately, estimates suggest that no more than 10 percent of these expenditures typically result in transfer to the job (Baldwin and Ford, 1988; Holton & Baldwin, 2000; Kupritz, 2002).

There have been numerous leading empirical studies in the area of training transfer to try and gain a better understanding of the factors that affect the transfer of training (Baldwin & Ford 1988; Ford, Quinones, Segó & Sorra, 1992; Lim & Morris, 2006; Facticeau, Dobbins, Russell, Ladd, & Kidisch, 1995; Rouiller & Goldstein, 1993; Tannenbaum, Cannon-Bowers, Salas, & Mathieu, 1993; Quinones, Ford, Segó & Smith, 1995; Wexley & Baldwin, 1986). These and other studies have offered many suggestions for the transfer of training. For example, there are two powerful influences that may help to enhance transfer. First, relapse prevention (RP) training (Marx, 1982; Noe & Ford, 1992) and second, supportive “transfer climates” (Rouiller & Goldstein, 1993; Tracey, Tannenbaum, & Kavanagh, 1995). The progress in these areas have provided a foundation for moving from concept to organizational application (e.g., Noe, Sears, & Fullenkamp, 1990; Tziner, Haccoun, & Kadish, 1991; Wexley & Baldwin, 1986).

In an attempt to try and gain consensus among training transfer literature, a quantitative approach (meta-analysis) was conducted as a way to combine numerous studies and provide users with an overall predictor of measurement. This approach will be used for this study. The context of this investigation will be in relation to the perceptions of the influences on training transfer in the workplace, the effects of managerial and non-managerial training, distinguishing between self-reporting and supervisor & peer reporting, and determining if differences exist between training and development. Background information concerning meta-analysis and training transfer along with the problem statement, purpose, research question, methodology, significance, and assumptions are included in this introduction chapter.

## **Background**

A major component of effective training is the ability of trainees to apply the knowledge, skills, and abilities gained in training to their work. The process of transferring new learning from the course into the organizational context had been comparatively neglected until about 25 years ago (Huczynski, & Lewis, 1979). Vandenput, 1973, was one of the leading pioneers to study training transfer and the organizational factors that influenced learning transfer. He argued that little emphasis had been put on the post-training phase, and upon the identification of the variables which operated to those in the learning acquisition phase during the training period (Huczynski et al. 1979).

Lewin, 1935, developed a theory that an individual action can be explained by reference to the various forces acting on the individual at a given time and place. He surmised that if one could identify the forces and assess their potency, it would theoretically be possible to explain human actions. Organizational development consultants have taken Lewin's ideas and applied them to an identification of why organizations perform the ways and at the levels they do (Huczynski et al. 1979).

Training transfer is a key factor for evaluating the effectiveness of people. An organization's competitive success hinges on achievements of its people (Pfeffer, 1994). It is only logical to assume that training, skills, and performance of employees is critical (Yamhill & McLean, 2001). The problem, however, is in understanding exactly what is needed or of value in the training arena. Kozlowski and Salas, 1997, stated that gaining knowledge, skills, behaviors, and attitudes during the training process would not help the

organization in the long term if these items are not correlated to the job setting and maintained over time. Thus, the employee's work environment becomes a key point of interest. Performance is key (Swanson, 1995) and there are many factors to consider within the workplace. Important factors that may influence training transfer are supervisor support, workplace support / transfer climate, peer support, subordinate support, frequency of use, tasks constraints, relapse prevention, goal setting, and continuous learning culture. Yamnell et al., 2001, stated "if we believe that training truly makes a difference in organizational and individual performance, we must understand how to support transfer of training in organizations".

### **Problem Statement**

To gain a better understanding of the construct of training transfer within the post-training environment, it is important to completely understand the influences on training transfer and how those issues reflect the workplace. Investigating training transfer as a dependent variable in the workplace is one way of assessing the influences found there.

It is also important to make sense of the multitude of studies on training transfer. There have been several meta-analyses performed (e.g., Author, Bennett, Edens and Bell, 2003; Colquitt, LePine, & Noe, 2000; Taylor Russ-Eft, Chan, 2005) that focused on the transfer of training. These studies helped to gain consensus among numerous published articles by assigning specific criteria to the review process in order to measure similar studies. There appears to be less research in the field of training transfer specifically designed to focus on work environment factors in the workplace. Even less, is any meta-analysis performed to assess these same factors. Thus, this is an area within the training

transfer realm where research could expand our general knowledge and provide the academic community with an overall assessment on training transfer studies focused within the work environment. In addition, a discussion of the effects of managerial versus non-managerial training's influence on transfer in the workplace could provide value. An assessment of the method of reporting data (e.g., self-reporting, supervisor, or peer reporting) within the confines of the factors above could also shed light on the reliability of self-reporting. Finally, an assessment of training versus development could provide insight into whether differences exist when focusing on short-term training as compared to development which is more focused on knowledge broadening.

### **Purpose and Research Question**

The overall purpose of this research project is to perform an exhaustive meta-analysis to investigate the extent in which the work environment influences training transfer. The second objective is to analyze how post-training variables influence transfer differently depending on the type of training (e.g., management and non-management). The third objective is to analyze the methods of reporting (e.g., self-reporting, supervisor, or peer reporting) and if reliability issues exist. The fourth objective is to analyze training and development as compared to training transfer. In order to achieve the stated purposes, the research must be narrowed to a specific question. The primary research question is to determine the effects of post-training variables on training transfer, specifically when measured in the work environment, and whether transfer moderators can affect training transfer.



## **Methodology**

The study is quantitative in nature and employs data analysis applied to summaries of individual studies. Existing data will be gathered from training transfer studies and incorporated into a database for additional analysis. Four basic criteria will be applied to determine study inclusion. First, the studies must incorporate training transfer as a dependent variable. Second, the studies must measure transfer in the workplace. Third, the studies must include measures of workplace related factors. Finally, the studies must contain basic statistical data so that an analysis can be performed. The goal of this meta-analysis of correlations is a description of the distribution of actual correlations between a given independent and a given dependent variable (Hunter and Schmidt, 1990). If the study is conducted perfectly, then the distribution of study correlations could be used directly to estimate the distribution or actual correlations (Hunter and Schmidt, 1990).

A coding scheme will be developed so that interpretation of the coding process can be captured and validated by independent reviewers for overall agreement on article inclusion. After an exhaustive search of related articles is complete and coded, an overall analysis will be performed to examine post-training factors on training transfer. Finally, a moderator analysis will be performed to test whether effects of managerial and non-managerial training, self-reporting versus supervisor and peer reporting, and training versus development influences training transfer.

## **Significance**

The significance of this research should provide quantitative information on which factor is most influential on the effectiveness of training transfer in the workplace. This data will hopefully provide researcher's new avenues to pursue that would be beneficial to understanding the influences on training transfer and implications of managerial versus non-managerial involvement, self-reporting versus supervisor and peer reporting, and training versus development.

## **Assumptions/Limitations**

The method of meta-analysis has much in common with those of survey research. Both engage in a process of surveying and analyzing in quantitative ways large populations of studies (Glass, McGaw and Smith, 1981). But many of the issues faced in a meta-analysis are due to the problems addressed in survey design and analysis (Kish, 1965). The difference between the two is that survey research struggles with the problems of causality (Glass, McGaw and Smith, 1981). One limitation of this study lies in the reviewing and integrating of research literature. The methods of identification of the literature and coding process can often take a scattered or objective approach and leave a level of uncertainty within the captured data.

## II. Literature Review

### Overview

This chapter provides a review of the literature relevant to training transfer in the workplace and a quantitative technique (meta-analysis) to be used for assessing consensus. The meta-analytic review will focus on the foundation of this quantitative technique, stages of the process, and benefits of performing a meta-analysis. The training transfer review will focus on the factors that impact training transfer, factors that impact learning, learning climate, sustained use of skills, constraints and opportunities, and managerial versus non-managerial training. Figure 1 displays a visual representation of this meta-analysis.

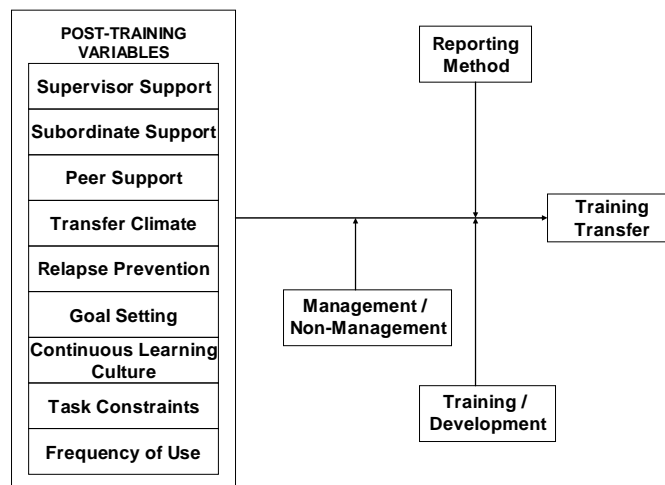


Figure 1. Model this meta-analysis used to evaluate the effects of post-training variables on training transfer, with three moderators.

## **Training Transfer**

Many empirical studies have examined training from several different perspectives, but the unique contribution of this research is to narrow the discussion down to work environment factors that impact the transfer of training and try to distinguish this study even further from previous meta-analysis by offering a comparison of self-reporting measures versus other sources, (i.e., supervisors, peers). In addition, the effects of managerial versus non-managerial training and training and development could add valuable insight into successful initial transfer and maintaining long-term training transfer.

There have been a number of work environment factors studied, including top management, supervisor and peer support (Faction et al., 1995), task constraints and opportunity to perform (Ford et al., 1992), and learning transfer climate (Bates & Khasawneh, 2005). The goal of this meta-analysis is to offer a valuable addition to the contributions already available within this field, by examining these factors in the workplace and summarizing their effects.

### *Training Transfer Background*

The term training transfer is described as trainees effectively and continually applying the knowledge, skills, behaviors and cognitive strategies to the workplace (Noe, 2005). There are two levels of training transfer described by Noe 2005, generalization training and maintenance training. Generalization training is one's capability to apply verbal knowledge and their motor skills directly to the work environment. Training maintenance is the process of using trained abilities continually through time.

Transfer of training can be defined as “knowledge, skills and attitudes learned from training that are generalized to the job context and maintained over time” (Baldwin and Ford, 1988). There are two basic types of training: formal and informal. On-the-job training is considered informal training; whereas formal training is as the name implies, more formal. This would involve an approved curriculum in a work center classroom or even a more formal version would be an actual school dedicated to teaching training. The articles included in this study were developed from formal training.

### **Forms of Transfer**

There are many different types of transfer and purposes for training. There are also many different objectives that a training organization may have in terms of training employees. To determine if training transfer is successful it is often necessary to know the goals of the training program and not to assume training transfer in the general sense. For example, a very specialized maintenance course (technical training), which teaches to maintain an updated version of a technical system, will focus on acquiring specific transfer (Barnard, Veldhuis, van Rooij, 2001). Another type of training may focus on horizontal transfer where transfer is from one task to another. Barnard et al., 2001, provide an overview of the different forms of transfer, (Table 1), and give an explanation of the different forms of transfer. The type of transfer must be strictly related to the goals of the course, and therefore to the criteria to be used in evaluating transfer of training (Barnard et al, 2001). If the percentage of transfer is low within an organization, a possible area to be concerned with is the criteria and measures being used for training and evaluation. The focus of this study is on the form of positive transfer.

Different Forms of Transfer		
Transfer	Explanation	
<i>Positive transfer</i>	<ol style="list-style-type: none"> <li>1. Extent to which trainees have acquired knowledge, skills and attitudes, which can be applied effectively in work practice</li> <li>2. Previously acquired knowledge, skills and attitudes facilitate the learning of new knowledge, skills and attitudes</li> </ol>	Baldwin & Ford, 1988; Jelsma, 1989
<i>Negative transfer</i>	<ol style="list-style-type: none"> <li>1. Extent to which an undesired effect occurs after following a course</li> <li>2. Previously acquired knowledge, skills and attitudes hinder the acquisition of new knowledge, skills and attitudes</li> </ol>	Baldwin & Ford, 1988; Jelsma, 1989; Gick & Holyoak, 1987; Patrick, 1992
<i>Far transfer</i>	Transfer when the initial learning task and the subsequent tasks to be learned differ substantially	Gick & Holyoak, 1987; Gielen, 1995; Tannenbaum & Yukl, 1992
<i>Near transfer</i>	Transfer when the initial learning task and the subsequent tasks to be learned differ only slightly or not at all	Gick & Holyoak, 1987; Gielen, 1995; Tannenbaum & Yukl, 1992
<i>Low-road transfer</i>	Transfer based on intensive and varied training, and occurring by means of automatic use of acquired knowledge and skills in a new context	Salomon & Perkins, 1990
<i>High-road transfer</i>	Transfer based on consciously abstracting of already acquired knowledge and skills from one context to another	Salomon & Perkins, 1990
<i>General transfer</i>	The trainee acquired certain working methods, knowledge and skills which can be used in tasks other than the original learning task	Gick & Holyoak, 1987
<i>Specific transfer</i>	The learning task is so specific that no transfer can be expected to other tasks	Gick & Holyoak, 1987
<i>Horizontal transfer</i>	Transfer from one task to another	Patrick, 1992
<i>Vertical transfer</i>	Transfer within a certain task, with growing expertise	Patrick, 1992

Table 1, Different Forms of Transfer (Barnard et al, 2001)

## **Workplace Transfer for Managers**

Organizations spend millions of dollars on manager and executive training in hopes of gaining a competitive advantage for their company (Watling, Prince, & Beaver, 2003). The results are that these senior members within these companies are enjoying the training experience but return to work and either forget, or put on the shelf, what they have learned (Haskins & Clawson, 2006). All the materials received during training make their way into the office “black hole” and managers go back to dealing with the pressures and pace of work. As Longenecker, 2004, wrote “the transfer of learning of knowledge and practices from the classroom to the workplace can be very limited”.

Yamhill & McLean, 2001, stated that whether one achieves long-term transfer is dependent on the training program itself. Haskins & Clawson, 2006, gathered a group of experienced executive instructors together to look for mechanisms they could all use to facilitate the transfer of training. Their work is a continuation from Longnecker & Ariss, 2002 and Longenecker, 2004, whose focus was assessing managers’ (participants) ideas for transferring executive and managerial training back into the workplace. Haskins & Clawson, 2006, decided to focus on the designers and deliverers of training rather than on participants, and to focus on face-to-face contact rather than on surveys. There was consensus on a few post training mechanisms thought to increase long-term transfer that correlate to the independent variables listed within this thesis. For example, the establishment of relationships (e.g., supervisor / peer support, organizational support, coaching) within the workplace will help cement and advance program learning and serve as a form of accountability (Haskins & Clawson, 2006). By having key individuals

within the organizations ask “How is the implementation of the new training coming?” or “What do you need to be successful with this new program?” can give the trainee the initiative to use what has been trained while offering the company the opportunity to ensure their money is being well spent.

Other insights into the post-training mechanisms was to develop ideas (e.g., goal setting) and to get everyone involved (e.g., relapse prevention) in the process in order to make training stick (“Sticky training” being a term used by Haskins & Clawson). This concept involved getting individuals involved in follow-on seminars, developing ideas within their organization, and collaborating on articles. Relapse prevention could also be avoided by adding publication mailings to trainees to keep them abreast of current issues and by having instructors periodically contact trainees to see how things are going and to reinforce both the training organization and employer’s commitment to the process (Haskins & Clawson, 2006).

### **Distinguishing Between Training and Development**

There are many concepts that need to be discussed when performing this meta-analysis. One such concept in this case is the difference between training and development. How these elements relate are major factors to the discussion of training transfer in the workplace. In general, training tends to be more narrowly defined and has a short-term focus, while development is focused more on broadening one’s knowledge and skills for future responsibilities such as for example, obtaining a graduate degree.



## **Managerial Versus Non-managerial Support**

There have been many reasons proposed as to the cause of continued low transfer of training. One study noted a failure to align many training programs with the direction of the organization as being one of the root causes of low levels of transfer (Carnevale, Gainer, and Villet, 1990; Casner-Lotto and Associates, 1988). Other studies have explored the degree of connection between the training professionals in the organization, the trainees themselves, and the line managers who supervise the trainees (Brinkerhoff & Montesino, 1995). There are also studies that noted neglect by trainers and managers before and after training that could affect transfer (Tannenbaum and Yukl, 1992). Some simply found that organizations just do not have the training support or capability to manage training transfer which obviously would cause low levels of transfer (Broad, 1982; Newstrom, 1986). Finally, others have taken a different approach from organizational or managerial influence effecting transfer and noted an individual's motivation to learn as effecting transfer (Hicks and Klimoski, 1987 and Schmitt, 1986).

Management's perception as to their role and responsibilities with regards to training and trainees may account for and explain a possible correlation between a lack of supervisor involvement and poor transfer rates. Brinkerhoff & Montesino, (1995), found that managers and supervisors tended to perceive the training function as being under the exclusive domain of the trainers, while trainers saw their responsibility to be limited to development and delivery of quality training. They also discovered that the managers / supervisors and trainers defined each of their roles as separate with no overlap and independent of each other. The outcome of this study allowed the organization to see that

management support was critical to successful training transfer and top management searched to find ways for managers and supervisors to get more involved in the training process.

The multitude of studies performed on the success and failure of training transfer may find numerous variables or possible links of cause and effect but one underlying variable that seems to reside on a consistent basis is managerial support. Brinkerhoff & Montesino, (1995), reported that the group in their study with higher transfer scores reported higher averages in their perception of supervisors' encouragement to learn new skills taught (3.1 versus 2.4) and the frequency that trainees had the opportunity to apply skills (3.4 versus 2.6). Also, when the trainees were asked to list factors that affected their training transfer, there were fewer factors listed for those who had supervisor support as opposed to those supervisors who did not support training (27 versus 41).

Managerial and supervisor intervention may indeed positively affect the transfer of training. Many studies link supervisor support, encouragement, or overall involvement in the training process as affecting the trainee's perception, which in turn, increases the level of transfer. There may be possible explanations to the success of supervisor involvement such as supervisors individually selecting employees or creating an atmosphere of high expectations that would lead employees to take their job and training more seriously (Brinkerhoff & Montesino, (1995). But in general, it only seems logical that providing supervisor support and encouragement to subordinates would reap positive outcomes versus a lack of interest.

## **Managerial Versus Non-managerial Training**

Determining the effect of long-term transfer based on the type of employees (e.g., manager or worker) receiving the training may provide insight for corporate America to best utilize their training dollars. Many studies focus on either managerial or non-managerial training but research that directly looks at the long-term effect of training based on position within the company is a challenge.

A fact that may be significant is that managers have a greater potential for autonomous action within the organizational context and are in that respect freer to introduce changes within their departments or sections (Huczynski et al, 1979). Huczynski and Lewis, 1979, compared three research studies (Vandenput, 1973; Weiss, 1978; & Jones & Rogers, 1977) to determine if there are any universally potent organizational factors which inhibit or encourage the transfer of management course learning into companies, or whether each organizational context contain its own unique mixture of these forces.

One of the comparative results was that there may indeed be a number of classes of variables, which facilitate or inhibit transfer and which exist irrespective of the particular organizational context being studied (Huczynski et al, 1979). Vandenput & Weiss' studies showed that the key influence of transfer was the superior; while Jones & Rogers found colleagues to be the key to successful transfer. Huczynski & Lewis suggest that personalities may be the key factor in successful managerial training based on the rigidity, conservativeness, openness to new ideas and the preparedness to take responsibility by other organizational personnel. Their conclusions were that "relations"

(e.g., learner-boss, learner-colleagues) may constitute a primary facilitating force in the transfer of learning. The two key findings from this study that are significant to this thesis, are that 1) the influences that occur in managerial training are no different than non-managerial training and 2) managers have more ability to control the long-term transfer process within their organization and therefore may have higher levels of long-term transfer simply because they make the decisions and are more capable of facilitating change.

Another study, Huczynski & Lewis, 1977, suggests that employer-sponsored managerial training to be more likely to succeed as it is beneficial to the success of the organization. If the participants are encouraged to attend training because the “boss” feels it is in the best interest of the company then the biggest inhibiting factor is the individuals own motivation. Second, the individual’s motivation to transfer learning can be enhanced if he can either be enabled to make his own decision regarding course attendance, or is directly involved with others in the process (Huczynski & Lewis, 1977). Third, the pervading influence of the learner’s superior in all phases greatly strengthens transfer (Huczynski & Lewis, 1977).

These findings suggest that 1) company leadership can impose a greater level of motivation down to their managers that is probably difficult to replicate from management down to worker levels; 2) The opportunity to make your own decision to attend training is more likely to occur at the management level versus the non-management level simply due to the position within the company, and may be a factor that influences higher levels of training transfer at the managerial level; and 3) The

motivation to learn can be greatly enhanced when senior management is pushing the training. It seems obvious that higher levels of transfer would occur with managers when the trainees know senior management wants you to succeed and is monitoring your progress. This effect can greatly change the outcome of transfer that those at the non-managerial level may not have due to the level of training. The force behind worker training is probably going to be the immediate supervisor. This support can also have a positive effect but probably not as intense as senior management's focus on you. Therefore, the driving force behind the training may be a factor to success and this factor is usually projected down to the managerial level.

### **Sustained Use of Trained Skills**

#### *Short-term Transfer*

The success of transfer of training in the short-term can be greatly attributed to three factors: supervisor support, trainee's perceived relevance of training, and trainee's motivation (Axtell, Maitlis, & Yearta, 1997). Taking this concept to a deeper level, Laker, 1990, describes near transfer (short-term transfer) as "the application of learning to situations similar to those in which initial learning has taken place". The theory of near term transfer is based on the presentation and development of the training program and suggests several ways to increase short-term transfer by following their near term recommendations (Yamnill & McLean, 2001). These recommendations were initially researched by Clark and Voogel, 1985 and elaborated upon in Yamnill et al, 2001. There were five basic suggestions offered to increase short-term transfer: 1) Familiarity: if the training material and program is reflective of the workplace, there may be an increase in

near transfer (Baldwin and Ford, 1988): 2) Specificity: if trainees know exactly where and how the training is going to be used and applied in their job, near transfer may increase (Clark et al, 1985): 3) Repetition: this involves over-learning the trainee to increase near transfer (Noe, 1986): 4) Procedures: emphasize the task at hand more often and this may increase near transfer (Clark et al, 1985): 5) Limit training: restrict the training to exactly what the trainee is being prepared to perform in the workplace (Clark et al, 1985). By following Laker, 1990, “Identical Elements Theory”, an organization may be able to affect the outcome of short-term transfer.

#### *Long-term Transfer*

The critical factor in the success of long-term transfer is the success obtained during the first month, short-term transfer, after the completion of training, when the individual starts working (Axtell et al., 1997). Although initial success is critical, there are other factors that will play a role in training transfer over the long haul (Axtell et al., 1997). Far transfer (e.g., long-term transfer), is “evidenced by the ability to apply a particular skill, or bit of knowledge, to different situations differing from those encountered during original learning” (Royer, 1979). The concept of far transfer is just the opposite of near transfer. More clearly stated, “far transfer is the application of learning to situations dissimilar to those of the original learning events (Yamnill & McLean, 2001). In order to facilitate long-term transfer, near term concepts must not be used while creating variety and digging deeper into the “why” training is necessary, is important (Yamnill, & McLean, 2001). In conjunction with the concepts developed for near term transfer noted in the previous section, the same authors offer suggestions to

increase far term transfer: 1) Ensure the trainees understand the underlying principles, concepts, and assumptions of the task at hand (Goldstein, 1986): 2) Have trainees practice in different context and develop variety as they practice (Goldstein, 1986): 3) Constantly encourage trainees to discuss and apply the training in situations that would be most beneficial for them (Noe, 1986): 4) Encourage trainees to use their new skills in situations other than those for which they were initially intended (Goldstein, 1986). The “Principles Theory” suggested “is critical to far transfer because knowledge can be abstracted and connected to new problems” (Yamnell & McLean, 2001). If trainees are given the opportunity to practice their new skills and have a deeper understanding of the principles and concepts involved, chances are that when challenges and problems arise in the long term, they will fall back on these skills (Yamnell, & McLean, 2001). Long-term workplace transfer is the key criterion of interest for this study and several of the research studies above suggest a connection to the independent variables within this study (e.g., supervisor & peer support, organizational climate & culture and relapse prevention) and facilitating successful long-term transfer.

### **Constraints and Opportunities**

The ability to measure training transfer in the workplace is obviously dependent on the opportunity to use the training on the job. Training opportunity is a critical factor to the success of training transfer, yet there has not been much study in this area (Holton et al., 1997). The obvious problem lies in how you measure the success of knowledge transfer or if there is even a measurement on whether the employee had the opportunity to use their new skill in the workplace. If you begin to incorporate additional factors

such as supervisor support into opportunity, it is easy to become confused as how to even measure successful transfer.

### **Constructs Included in This Research**

#### *Transfer Climate, Workplace Support, Continuous Learning Culture*

Transfer climate is the work environment factors perceived by trainees to encourage or discourage their use of knowledge, skills, and abilities learned in training on-the-job (Cromwell, & Kolb, 2004). In the past, research has often overlooked the affect of work environment variables on training transfer (Tannenbaum, S. I., Cannon-Bowers, J. A., Salas, E., & Mathieu, J. E. 1993). Organizations need to ensure that some learning of knowledge actually occurred during the training process by formal testing or post-surveys. Once this is assessed, an organization can determine the effect of transfer climate within the workplace.

If the work environment does not provide a means to support the transfer of new knowledge, this knowledge will soon be forgotten by the trainee and become irrelevant. The work environment must also provide a means to ensure that employees are motivated to transfer what they have learned. Positive environments will make no difference if the trainee did not learn or lacks motivation to transfer that knowledge. Trainees who perceive that the company embraces a continuous learning culture will have higher levels of training motivation (Chiaburu & Tekleab, 2005).

A continuous-learning work environment is "one in which organizational members share perceptions and expectations that learning is an important part of everyday life" (Tracey, Tannenbaum, & Kavanagh, 1995). Employees will believe that



this education and learning environment is essential to them and their careers (Cheng, 2000). There can be many benefits for employees who participate in continuous learning; their performance will improve, skill sets will be enhanced and provide more career opportunities, and their self-esteem will be enhanced (Eddy, Tannenbaum, Lorenzet, Smith-Jentsch, 2005). Organizations who want to succeed must realize that a need exists and develop a climate that is conducive to continuous learning (Eddy et al., 2005). The employees must also take a part in the process by showing a willingness to learn.

#### *Supervisor and subordinate Support*

Researchers have repeatedly shown that the extent to which managers and supervisors encourage, tolerate, or discourage newly acquired skills by the trainee greatly influence the extent to which training is transferred, leading to organizational improvements (Ford, et al. 1992; Axtell, et al., 1997). If supervisors create a positive training and work environment then the transfer of knowledge is more likely to occur and the employee will feel more willing to apply their newly acquired skills. But if the supervisors choose to not support training or the employees have no desire to use their knowledge, transfer will not be as successful and the chance of this new knowledge not being applied increases.

Support from subordinates and supervisors have also been found to affect pre-training motivation (Baldwin & Ford, 1988; Wexley & Baldwin, 1986). If employees receiving training believe that supervisors or subordinates will not support their training efforts, trainees are less motivated to even attend training or even try to learn (Baldwin & Ford, 1988; Wexley & Baldwin, 1986). Also, supervisors and subordinates must do more

than just say they support the training. A supportive supervisor and subordinate are ones which provided trainees with the opportunities and reinforcement for practicing skills or for using knowledge acquired in training (Noe, 1986).

#### *Peer support*

Peer support involves reinforcement and support through co-workers to use training skills and learning on the job. Peer support is the same as supervisor support but the positive or negative influences stem from the trainee's co-workers with whom interaction occurs (Toney, 2007). There has been an increase in research on peer support and the results are similar to supervisor support, where better environment equals a better employee. Employees feel more at ease and this allows for the transfer of training to occur at higher levels. In another study, Facticeau et al. (1995) found that peer support was not significantly related to pre-training motivation, and top management support was not significantly related to perceived training transfer. Bates, Holton, Seyler and Carvalho, (2000) found that peer support was indeed a significant predictor of learning transfer.

#### *Managerial support*

Managerial support has been identified as a key environmental variable affecting transfer (Ford et al., 1992; Huczynski and Lewis, 1980). Managers must encourage trainees to use new skills and tolerate employee mistakes as they progress. The relationship between immediate supervisor and trainee has been found to be the largest inhibitor to transfer (Vandenput, 1973). In relationships where supervisors are supportive, employees are likely to feel more comfortable performing trained skills (Ford et al., 1992).

The ability for managers to allow trainees the latitude to self-manage may also increase transfer and help trainees overcome the obstacles to using new skills and increase performance (Gist, Bavetta, & Stevens, 1990). It is therefore likely that the more control trainees have over their own work, the greater their ability to avoid obstacles to transfer and will incorporate new skills and knowledge into their job (Axtell et al., 1997). However, there have been other studies that contradict this conclusion and find that self-management has no effect on effectiveness (Wexley and Baldwin, 1986).

### *Relapse Prevention*

Relapse prevention has been incorporated into the post-training environment to keep trainees from relapsing into pre-training behaviors. The term itself was initially developed in relation to addictive behaviors (i.e., drug abuse, mental health and obesity). A model was eventually developed by Marlatt and Gordon, 1980, based on their studies that showed that certain short-term failure had a major impact for resuming addictive behaviors. They came up with a model designed to prevent relapse and maintain long term behavior modifications.

A couple of years later Marlatt and Gordon's 1980 model was used in the training environment. A new model was developed to give managers cognitive and behavioral skills in order to prevent full blown relapses in training behavior (Marx, 1982). Marlatt and Gordon's 1980 model worked well for managerial training because it views maintenance behavior from a perspective that locates determinants of treatment failure and when those are identified they can be exploited during daily activities to prevent a relapse into pretraining behaviors (Toney, 2007).

Relapse prevention has been found to positively affect a trainees' ability to transfer and desire to transfer (Burke, 1997). To help employees' continue using methods obtained during training and not lapse back into their old behaviors, Burke and Baldwin, 1999, used Marx's 1986 seven step process to conduct a group study. The results showed that in a bad transfer climate, the relapse prevention training was better than the modified, but in a positive climate the modified relapse prevention training seem to be more effective. Tziner, 1991, also found that those who were grouped together and exposed to relapse prevention had higher levels of learning scores and had better success at transfer.

### *Goal Setting*

*Intentions*, precursor to action, and *values*, intentions and commitment combined, are the two behavior elements focused upon in the goal-setting theory (Yamhill & McLean, 2001). In goal-setting theory, when an individual makes a formal effort to accomplish a task he either works on the task until it is completed or he makes the decision to quit (Locke, 1968). A goal is the objective of ones behavior performed; while goal setting is the path one follows to try and reach a satisfactory performance level (Yamhill & McLean, 2001). Goals direct attention and action while focusing efforts on the tasks at hand to reach a particular objective (Locke, Shaw, Sarri, and Latham, 1981). For performance to be successful individuals must have established goals and receive feedback on their performance (Locke et al, 1981). The goals that are set will be the primary difference between the trainees, making goal-setting critical to success (Locke et al, 1981). Establishment of goals must meet three criteria in order to be valid: Statistical

control, valid methodology, and trainees must be able to meet the goals (McLean and Persico, 1994). Even though there are contradicting studies that oppose goal-setting (eg., Gist, et al., 1990), the majority of evidence seems to show a positive effect on trainees when goals are in place (eg., Wexley & Nemeroff, 1975).

#### *Frequency of Use*

Individuals who have more control over the way they work may find they can create more opportunities to use new skills than those who have less autonomy in their jobs (Axtell et al, 1997). This is consistent with other findings which suggest that a key factor affecting transfer of training to the job is having the opportunity to use learned skills (Ford et al, 1992). Axtell and colleagues (1997), also suggest that autonomy appears to have the strongest effect on long-term transfer but also suggest that initial transfer success and motivation to use the skills are also important.

### **Hypotheses**

Based on previous research the following hypotheses are presented:

**Hypothesis 1:** *Managerial training will show lower levels of training transfer correlations than non-managerial training.*

**Hypothesis 2:** *Studies that use self-reporting will show higher levels of transfer than correlations from studies that use supervisor and peer reporting ((non) self-reporting).*

**Hypothesis 3:** *Training will show higher levels of transfer than development activities.*

### III. Methodology

#### Literature Search

To meta-analyze the relationships shown in Figure 1, an extensive literature search was conducted. This literature was then combined with data from a previous study (Toney, 2007), to provide a more robust analysis of training transfer in the workplace. Additional criteria (e.g., self-reporting versus supervisor or peer reporting, and training versus development) was combined with the original study, along with 48 additional research articles reviewed, six of which met the criteria of inclusion. Searches included a manual search of the following journals: *Journal of Applied Psychology*, *Personnel Psychology*, *Academy of Management Journal*, *Organizational Behavior and Human Decision Processes*, *Administrative Behavior*, *Journal of Management*, *Journal of Organizational Behavior*, *Journal of Vocational Behavior*, *Journal of Organizational and Occupational Psychology*, *Human relations*, *Training Research Journal*, *Human Resource Development Quarterly*, *Group and Organization Management*, *Journal of Personality and Social Psychology*, *Psychological Reports*, and *International Business Review*.

A review of bibliographies from journal articles and previous theses and dissertations was examined as possible sources of relevant articles. A manual search was conducted of the following: *Colquitt, et al., 2000; Bullock & Svyantek, 1985; Author, Bennett, Edens, & Bell, 2003; Taylor, Russ-Eft, & Chan, 2005; Alliger, Tannebaum, Bennett, & Shotland, 1997; Bateman & Jones, 2003; Wanous, Sullivan, & Malinak, 1989; Guzzo, Jackson, and Katzell, 1987; Buckley & Rullell, 1999; Hobbs, 2005; Eagan,*

Yang, & Bartlett, 2004; Schmidt, 1994; Holton, Bates, & Ruona, 2000; Xiao, 1996; Lim & Morris, 2006; Chiaburu & Tekleab, 2005; Egan, Yang, & Bartlett, 2004; Cheng, 2000; Alvarez, Salas, & Garofano, 2004; Al-Athari & Zairi, 2002; and Cheng & Ho, 2001.

The use of electronic databases (e.g., Google Scholar, DTIC, ABI /Inform, Inspec, InfoTrac, OneFile, Business Source Premier, Psych Info) was used to maximize coverage of potential sources for inclusion. This process involved developing a Microsoft Excel spreadsheet to track all terms used and databases searched. Numerous articles were requested through inter-library loan and required additional tracking for future review. Finally, a search for pending dissertations was conducted that yielded one study for inclusion in the dataset.

The criteria for initial selection and further investigation of articles to review from journals and theses, journal article bibliographies, and electronic databases, included the following key words within the titles: *Training, training transfer, transfer of training, training environment, job training, training effectiveness, training influences, training motivation, knowledge transfer, knowledge learning, organizational training, organizational effectiveness, organizational learning, learning, learning transfer, influences, learning influences, meta-analysis, training meta-analysis, and all independent variables combined with the term, training transfer.*

#### *Article Criteria*

Once the initial criteria of reviewing article titles and abstracts had been completed, a database of 134 articles remained for further consideration for inclusion.

The next step was to judge which of the 134 articles could truly yield codable information. The criteria for an article to be considered codable were as follows. First, training transfer must be the dependent variable in these studies. Second, the measurement of transfer must be in the workplace. This was a critical issue. General training transfer studies, although numerous, differ from training transfer in the workplace in that they fail to provide the critical relationship needed to assess short-term and long-term effects within the organization. Third, the studies need to have variables to measure that are related to what occurs in the workplace, such as: climate for transfer, peer support, subordinate and supervisor support, and workplace support. Fourth, the studies must contain statistical data to incorporate into the meta-analysis. The 34 articles selected for this study meet these four initial criteria for inclusion into this meta-analysis.

#### *Coding of Studies*

The reliability of any meta-analysis is only as good as the source of its data and the coding process. In meta-analysis, the differences in the studies are confounded with the differences in reporting style and thoroughness, so coding is often a difficult process (Bullock et al., 1985). In order to reduce potential errors associated with reliability, this study incorporated an independent coding process where three reviewers analyzed and coded the articles. The three members of this study practiced coding of eight articles independently to ensure consensus of coding techniques. Agreement levels for the two professors was identical, with specific levels of 100% (representing 8 of 8 articles coded the same). Student coding levels was also high, with specific levels of 88% (representing 7 of 8 articles coded the same). The article in question was reviewed and consensus



obtained. The remaining articles were coded by this author and one professor, with the other professor acting as the tie-breaker in cases of disagreement.

### *Data Set*

To judge codability, two students and one professor independently assessed whether each article could yield codable information. There were 78 articles that were initially coded in the previous research and 28 met the criteria for inclusion. Those 28 articles are included in this study, although the meta-analysis has been performed differently. The new student, reassessed these 78 articles and was in total agreement with the coding and inclusion of the same 28 studies. Again, the new study yielded 48 new articles that were initially coded and 6 met the criteria for inclusion. The individual members of this study for the most part agreed on codability. Agreement levels for this study were high, with specific levels of 100% (representing agreement on 28 of 78 previous articles for inclusion), 94% (representing agreement on 45 of 48 new articles, with 6 of the 48 being included), for an overall average of 98% agreement. A total of 34 articles were eventually categorized as codable and usable. The total (N) for this study increased marginally from 28 to 34 articles representing a 21% increase, but just as important as the inclusion rate is the total sample surveyed. The total articles found increased from 78 to 134 representing a 72% increase. As a result of the inclusion criteria, a data set of 94 calculations from 34 sources was obtained. This is significant for a meta-analysis as a study is only as good as its thorough review of available data. This study has increased confidence in our review process and available data for inclusion. Also, by strictly following our inclusion criteria and eliminating any questionable data

sets, we are also confident that the data fits our criteria. Simply stated, we are highly confident that all available research data meeting the criteria for this study is included and this data is valid. These articles are represented in the references section with an asterisk.

### **Meta-Analytic Methods**

Meta-analysis is the statistical analysis of the summary findings of prior empirical studies for the purpose of their integration (Glass 1976; Wolf 1986). To expand, it is a family of procedures designed to examine statistical effects reported across independent primary research studies. “Primary” research is simply research conducted on the phenomena of interest (e.g., training transfer), while secondary meta-analytic research is conducted on some statistic of interest generated by primary research studies (Buckley & Russell, 1999). During the mid 1970’s behavioral and social sciences reached a point where identical studies were constantly providing conflicting results. Studies important to theory development and social policy decisions resulted in constant disagreements to a point where it became more and more difficult to obtain funding for research. Scientists had known for many years that a single study would not resolve any major issue. This is where the foundation of meta-analysis came upon the research scene. The birth of meta-analysis has taken important steps in achieving ways to draw conclusions from past research. Cumulative knowledge is possible to obtain in the behavioral and social sciences and important questions can finally be answered (Hunter & Schmidt, 1990).

There are three additional advantages of adopting a meta-analysis approach: 1) it typically collates information from a greater number of studies; 2) it is relatively straightforward to control for methodological differences between valuation source

studies; 3) benefit transfer is readily affected by setting explanatory variable values to those at the desired target site be it a previously surveyed, un-surveyed, or just proposed (i.e., currently non existent) site (Rosenberger and Loomis, 2000).

The initial stage of any meta-analysis involves a survey of the relevant literature to identify potential base data studies (Bateman & Jones, 2003). To expand upon this in greater detail, the steps of conducting a meta-analysis are (1) search for and gather studies, (2) extract and code information from the studies, and (3) apply meta-analysis to the information extracted (Hunter & Schmidt, 1990).

#### *Benefit of meta-Analysis on training transfer*

Training is one of the most pervasive methods for enhancing the productivity of individuals and communicating organizational goals to new personnel (Author et al., 2003). In 2000, U.S. organizations with 100 or more employees budgeted to spend \$54 billion on formal training (“Industry Report,” 2000). There is an obvious need for employers and researchers to better understand the factors associated with organizational training and the effectiveness of that training in the work environment. There is also a wide range of calculations between training transfer and the independent variables that make distinguishing between these relationships controversial. Taking the meta-analysis quantitative approach to training transfer offers an additional advantage. It makes it possible to assess relationships not investigated in the original primary studies and allows for an overall conclusion or summary across these studies (Author et al., 2003).

The biggest benefit of applying meta-analysis to the effectiveness of workplace transfer is that there have been only limited studies (as compared to overall transfer

studies) specifically designed to look at transfer within the workplace. Combining these studies through the use of a meta-analysis may bring value to the training environment. There have been many meta-analyses in other areas such as cognitive ability, employment interviews, and personality testing, but there has been very little work done on effectiveness of training transfer (Author et al., 2003). Creating a training transfer construct with variables such as workplace support, transfer climate, supervisor support, peer support, subordinate support, relapse prevention, goal setting, task constraints, frequency of use, and continuous learning culture will provide valuable insight into the overall effectiveness of these factors from a culmination of leading experts in the research field. The research can be further defined by adding additional factors such as the type of management support and how the information was actually reported (i.e., self-reported, supervisor reported). This meta-analysis on training transfer in the workplace will help close the gap on training effectiveness and provide researchers and organizations valuable information for future training methods and how best to utilize training dollars.

#### *Meta-analytic Limits*

A meta-analysis can account for many different factors (e.g., variances and sampling error), but human motivation can greatly taint the outcome. Many literature reviews have shown that the purpose or source of motivation driving decision situations greatly influences both cognitive processes and decision outcomes (Buckley et al., 1999). The following two statements clarify even further, (1) “If the universe of all criterion-related validity studies ever conducted were included, meta-analytic results can still be

influenced by the capabilities and motivational agendas of the original investigators...” (Russell , C. J., Settoon, R.P., Mcgrath, R. N., Blanton, A. E., Kidwell, R. E., Lohrke, F.T., Scifires, E. L., & Danforth, G. W., (1994). (2) Judgment calls made by researchers may have their decision making influenced by their capabilities and motivational agenda resulting in enhanced estimates (Wanous,et al., 1989). This suggests that key research decisions are influenced by the researcher’s source of motivation in conducting the study to begin with (Russell et al., 1994). Though meta-analysis has its own set of shortcomings where internal and external threats to inference validity could exist, many editors are requiring authors to provide research findings beyond the original scope in an effort to validate the studies (Buckley et al., 1999).

## **Measurements**

### *Sample*

The targeted studies selected for participation in this meta-analysis were peer-reviewed articles, theses, or dissertations. The extensive review process for publication that studies undergo helps ensure the accuracy of the information being collected. The names of the journals, articles, and authors were collected and coded in a database to help ensure proper collection procedures.

### *Reliability*

Probably one of the biggest concerns with meta-analysis is reporting the measures of reliability. If the researchers actually report reliability in their study then it is easy enough to account for and include in the meta-analysis. But if this data is missing it could create numerous problems. Trying to perform a meta-analysis on hundreds of

articles in which there may be limited reported reliability will only compound the problem. There are a couple ways to try and account for the reliability error other than just using articles that reported the information. Contacting the authors and simply asking them if they have any reliability data might be one method. A second suggestion might be to try and contact the journals publishing these articles and see if there is any information available or if any type of reliability assessment was conducted after the article was published. These techniques were not attempted due to time constraints for this study. Instead, we tried to account for correction of sampling error and unreliability in variables by the use of statistical methods outlined by Hunter and Schmidt, 1990.

#### *Validity*

One of the key factors of construct validity is an understanding of what you are actually measuring. For example, when measuring “training transfer”, is training transfer what you are really measuring? More importantly, training transfer has been defined in different ways by previous researchers. One of the first steps in this meta-analysis was to have an agreed upon definition to what is actually meant by training transfer. All three reviewers coding articles for inclusion in this study all agreed on the term and definition of “training transfer”.

#### *Availability*

One potential issue with meta-analysis research is concerned with public availability. This is critical because the research itself is based on the ability to get public access to the information (Bullock & Svyantek, 1985). It is important that many aspects of the studies be made available. For example, coding rules, list of studies used in

review, documentation on how the coding schemes were resolved, copies of data sets, and even the copies of the analyses performed (Bullock & Svyantek, 1985).

#### *Study Characteristics*

Study characteristics are another problem that needs to be addressed in meta-analysis. Bullock and Svyantek (1985) suggest that study characteristics should be included in all meta-analysis research in order to understand fully the nature and limits of the research domain. Regardless of whether you have generalized validities, it is still critical to report study characteristics because they precisely define the domain over which the validities can be safely generalized (Bullock & Svyantek, 1985).

#### *Reporting and Interpretation*

Selective reporting and interpreting the results can also create issue with a meta-analysis if not properly addressed. One issue with selective reporting is the potential for bias. Bias is particularly a problem in exploratory meta-analysis where variables are included on convenience of ease of coding (Bullock & Svyantek, 1985). One possible way of addressing this issue, is to develop the hypotheses to be tested in advance of the coding, code only those variables to be directly tested by the research, and fully report the results (Bullock & Svyantek, 1985).

#### *Objectivity*

In performing any research project, researchers start the project or design a hypothesis based on what they would like to accomplish or what results they would like to see. This can create problems with the results if one does not objectively look at the

data for what it is actually representing. Interpretation problems may arise as we try and confirm what we already feel we believe to be the case (Bullock & Svyantek, 1985).

### *Judgment calls*

The bottom line for meta-analysis is that there are many judgment calls that need to be made and how you do this will affect the results of your study. Most researchers focus on the quantitative aspect of a meta-analysis as the answer to everything but how individuals actually make judgments in their research will make or break the final results. Trying to avoid judgment calls in a meta-analysis will not solve the problem, neglecting to deal with them explicitly does not lessen their impact (Wanous, Sullivan, & Malinak, 1989). It is easy to see that judgment calls is an issue for researchers because some of our leading experts in the field reach different conclusions using basically the same research and this is due to judgments they have made (Wanous et al., 1989).

Wanous et al., (1989) offer three ways to try and avoid judgment calls. First, if possible, have only one individual perform the meta-analysis. Second, have more than two individuals perform the coding of data independently and a measurement of agreement reported. Third, make independent judgments when it appears that the selection of studies to include is difficult. Many of these issues mentioned above have already been discussed for this study and are incorporated within this meta-analysis.

### *Self-ratings*

There is always the possibility of issues concerning reliance on self-ratings for all the variables in this or any study. The purpose of this meta-analysis is to include as many studies as possible, keeping in mind, we are limited by the studies that are available and



the means of data collection is beyond control. One option available, and used, was to perform a moderator analysis using self-reports as an independent variable. This is an important issue in the field of transfer training and analyzing the correlations from separating self-reported data to compare to supervisor and peer reporting provided added value for this meta-analysis.

### **Moderator Analysis**

The initial analysis combined supervisor support, peer support, subordinate support, workplace support / transfer climate, tasks constraints, continuous learning culture, and frequency of use together to form a combined overall organizational support element called *environmental support*. Relapse prevention and goal setting were excluded from environmental support as these variables were not considered organizational support variables as they are techniques taught during training, and in the case of relapse prevention may be used to overcome lack of organizational support. Due to the overall limited studies found for some independent variables, combining support variables may provide additional insight into overall correlations. But the main reason to combine these studies was to show the correlation between training transfer and all support measures, because some researchers have combined them in their studies, while others have broken them out separately. Moderator analyses were also performed using all the independent variables to compare managerial versus non-managerial training, self-reporting versus other, and training and development.

## Data Analysis

Hunter and Schmidt, 1990, *Methods of Meta-Analysis*, was used as the primary guidance for this study. All formulas used to correct for sampling error and unreliability came from this book. The first step in a meta-analysis is to identify and account for artifacts. These artifacts can alter the size of the study correlation in comparison to the actual correlation. Hunter and Schmidt identify eleven artifacts that should be taken into account. These include: sampling error, error of measurement in the dependent variable, error of measurement in the independent variable, dichotomization of a continuous dependent variable, dichotomization of a continuous independent variable, range variation in the independent variable, attribution artifacts: range variation in the dependent variable, deviation from perfect construct validity in the independent variable, deviation from perfect construct validity in the dependent variable, reporting on transcriptional error, and variance due to extraneous factors.

It is possible to correct for each of these errors except reporting and transcriptional error. There is just no way to correct for bad data (Hunter and Schmidt, 1990). Hunter and Schmidt suggest using their formulas based on a very large sample size (specific N not given) because sampling error decreases as the sample size grows. But it is important to note that Hunter and Schmidt state that these methods can still apply to small sample sizes, but sampling error will still exist in the final meta-analysis results if the sample size is small.

The data from each study that met the criteria was placed under one of the nine independent variable categories. An additional category, environmental support, was

developed that combined all the support independent variables other than goal setting and relapse prevention.

### **Meta-analytic Cumulation**

The steps below describe a broad outline provided by Hunter and Schmidt (1990) of when and how to cumulate results across studies. This process was followed for this study. The details of sampling error and unreliability corrections are explained in detail following this outline.

1. "Calculate the desired descriptive statistic for each study available, and average the statistic across studies" (Hunter and Schmidt, 1990).
2. "Calculate the variance of the statistic across studies" (Hunter and Schmidt, 1990).
3. Correct the variance by subtracting the amount due to sampling error" (Hunter and Schmidt, 1990).
4. "Correct the mean and variance for study artifacts other than sampling error" (Hunter and Schmidt, 1990).
5. "Compare the corrected standard deviation to the mean to assess the size of the potential variation (z-score) in results across studies in qualitative terms. If the mean is more than two standard deviations larger than zero, then it is reasonable to conclude that the relationship considered is always positive" (Hunter and Schmidt, 1990).

### **Correcting for Sampling Error**

Sampling errors can have a devastating effect if not corrected and accounted for within the literature (Hunter and Schmidt, 1990). Therefore it was imperative to correct for sampling error. The process used is listed below and follows Hunter and Schmidt's 1990 guidance and is accomplished for each independent variable and the moderators. Sample size and correlations are needed to correct for sampling error. If correlations are missing, the study cannot be used to correct for this artifact.

1. Calculate the total sample size of all data sets.

2. Multiply sample size by the correlation between the independent and dependent variable ( $N \times r$ ) to calculate average correlation (R-Bar) for each study. The average correlation for each study is then summed and the total is divided by the total sample size. This will provide the overall sampling error average correlation (R-bar). The R-bar will also be used to correct for unreliability.

3. Subtract the individual study correlation by the overall average correlation (r-bar), square the result ( $rd^2$ ), and multiply by the individual study sample size ( $N_i$ ). The total is then summed and is divided by the total sample size. This provides the variance of the correlations ( $\sigma_r^2$ ). The variance due to sampling error and standard deviation of the population can now be calculated.

4. The variance due to sampling error is calculated as follows:  $(\sigma_e^2 = (1-(R\text{-bar}^2) / (\text{average sample size} - 1))$ .

5. Standard deviation of the population ( $\sigma_r$ ) is calculated as follows:  $(\sigma_r^2 - \sigma_e^2)^2$ . This standard deviation will be used to correct for unreliability.

### **Correcting for Unreliability**

Correcting for unreliability is used to correct error of measurement in the dependent and independent variable. These calculations will provide the actual mean study correlation used to determine the true correlation between the independent variables and training transfer. To correct for unreliability, for each study at least one of the following is needed: the independent variable  $\alpha$ , transfer of training  $\alpha$ , sample size, and the independent variable-transfer of training correlation (r). The process used is

listed below from Hunter and Schmidt (1990, p111-198) and is accomplished for each independent variable and moderator.

1. Calculate the square root of the individual and transfer  $\alpha$  ( $\sqrt{\alpha}$ ).
2. Calculate the average of the individual  $\alpha$ , transfer  $\alpha$ , and sample size then square the sum of each.
3. Calculate the standard deviation of the individual  $\alpha$ , transfer  $\alpha$ , & sample size then square the sum of each.
4. Calculate the mean compound attenuation factor (A-bar): (average individual  $\alpha$  × average transfer  $\alpha$ )
5. Calculate the mean actual study  $r$ : ( $\sigma^2_{\rho} / \text{A-bar}$ ). The  $\sigma^2_{\rho}$  is obtained from the sampling error calculations.
6. Calculate  $\sigma^2_r$ : (SD of pop)<sup>2</sup>
7. Calculate ( $\sigma^2_e$ : 1<sup>st</sup> calculation: (# of data sets × (1-(r-bar)<sup>2</sup>); 2<sup>nd</sup> calculation (# of data sets × average N). Finally,  $\sigma^2_e = 1^{\text{st}} \text{ calculation} / 2^{\text{nd}} \text{ calculation}$ .
8. Calculate Variance:  $V = (\text{Individual } \alpha \sigma^2 / \text{Individual } \alpha \text{ average}^2) + (\text{transfer } \sigma^2 / \text{average transfer } \alpha^2)$ .
9. Calculate S<sup>2</sup>: (mean actual study  $r$ )<sup>2</sup> × (A-bar)<sup>2</sup> × variance (V)
10. Calculate s<sup>2</sup> roe: ( $\sigma^2_r - \sigma^2_e$ )
11. Calculate variance in true score correlation: ( $s^2_{\rho} - S^2$ ) / (A-bar)<sup>2</sup>
12. Calculate true SD: (variance in true score correlation)<sup>2</sup>
13. Calculate credibility interval: = (+-) .5 of Mean actual study  $r$
14. Calculate Z-score: mean actual study  $r$  / True SD

The above formulas produce the corrected standard deviation, the mean actual study unreliability, and the z-score (positive or negative relationship of the independent variable to the dependent variable).

### **Correcting for other Artifacts**

The remaining eight artifacts discussed by Hunter and Schmidt 1990 were not corrected for within this study. As previously mentioned, reporting and transcriptional errors (bad data) are impossible to account for and correct. The remaining seven artifacts were not corrected due to either the information not being provided in the original studies or a particular artifact did not apply to the data set included within this study. The remaining artifacts are discussed below:

Dichotomization of a continuous dependent variable occurs when a variables range is split into high and low categories. For example, turnover, the length of time that a worker stays with the organization and is often dichotomized into categories such as “less than one year / six months” or “more than one year / six months” (Hunter & Schmidt, 1990). This process would have been performed by those conducting the research. For this meta-analysis, training transfer was not transformed in this manner.

Dichotomization of a continuous independent variable is a process where the interviewers are told to dichotomize their perceptions into “acceptable” versus “reject” (Hunter & Schmidt, 1990). This process is obviously performed by those conducting the research. There were many studies that discussed their original sample size and reasoning for eliminating surveys or individuals, but this information was not recorded

for this study. Due to the nature of the independent variables in this study, it did not appear that this was issue in any of the 34 studies included in the data set.

Range variation in the independent and dependent variable is the condition where the standard deviation varies widely from study to study, resulting in widely different correlations. This can be corrected if studies are computed on samples from populations with the same standard deviation on the independent variable. This range correction formula estimates the effect of changing the study population standard deviation from one value to another (Hunter & Schmidt, 1990). In order to accomplish this we need to know the standard deviation of the independent variables then range departure is measured by relating that standard deviation to the reference standard deviation. Standard deviations were provided in 24 of the 34 studies included in this study. This process was not applied as a further 33 data did not have standard deviations to assess and would require further elimination of studies.

Deviations from the perfect construct validity for independent and dependent variables correct study validity from true validity if the test differs from the usual structure of the test or if contamination exists. This is another factor that cannot be assessed due to lack of information within original studies.

Variance due to extraneous factors corrects for differences in experience of the trainees at the time of assessment. Again, determining the experience levels of individuals within the study was not provided.

## IV. Results

The purpose of this meta-analysis was to cumulate studies of training transfer where data were collected in the workplace to determine true relationships after correcting for artifactual error. This meta-analysis also sought to determine if the type of training (management vs. non-management) or reporting (self versus other) showed differences in correlation levels. Finally, this meta-analysis compared training to development to see if differences in training transfer exist between actual training and knowledge broadening. The results of the meta-analysis are presented below and show that of the independent variables, peer support (.59) and relapse prevention (.52) showed the highest correlations to training transfer, after correcting for artifacts. The results also showed that managerial training (.32) had a higher correlation to training transfer as compared to non-managerial training (.20). Self-reporting (.28) also showed higher correlations to training transfer as compared to (non) self-reporting (.16). Finally, training (.30) had a higher correlation to training transfer as compared to development (.06). Table 2 includes correction for sampling error results for all the independent variables included in this study. Table 3 includes correction for unreliability results for all independent variables included in this study. Table 4 includes moderator analysis sampling error results for the four moderators within this study. Table 5 includes moderator analysis unreliability results for the four moderators within this study.



## **Descriptive Statistics**

*Environmental support* was a combination of all independent variables (24 studies) minus goal setting and relapse prevention. Correction for sampling error included 69 data sets, had a sample size of 14,356, average sample size of 208, average correlation of .23, standard deviation of population of .19, and a variance due to sampling error of .004. Correction for unreliability included 24 studies and 72 data sets, had an average sample size of 203, corrected standard deviation of .23, and resulted in a mean actual study correlation of .27, with a credibility interval of .22 to .32, and a confidence interval of .21 to .33. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.18.

*Supervisor support* was represented in 11 studies. Correction for sampling error included 17 data sets, had a sample size of 2,666, average sample size of 157, average correlation of .24, standard deviation of the population of .18, and a variance due to sampling error of .006. Correction for unreliability included 11 studies and 17 data sets, had an average sample size of 157, corrected standard deviation of .18, and resulted in a mean actual study correlation of .27, with a credibility interval of .22 to .32 and a confidence interval of .17 to .37. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.52.

*Workplace support / transfer climate* was represented in 17 studies. Correction for sampling error included 33 data sets, had a sample size of 6,122, average sample size of 211, average correlation of .23, standard deviation of the population of .19, and a variance due to sampling error of .004. Correction for unreliability included 11 studies

and 33 data sets, had an average sample size of 191, corrected standard deviation of .22, and resulted in a mean actual study correlation of .29, with a credibility interval of .24 to .34 and a confidence interval of .20 to .37. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.33.

*Peer support* was represented in 3 studies. Correction for sampling error included three data sets, had a sample size of 1,108, average sample size of 369, average correlation of .53, standard deviation of the population of .10, and a variance due to sampling error of .001. Correction for unreliability included 3 studies and 3 data sets, had an average sample size of 369, corrected standard deviation of .11, and resulted in a mean actual study correlation of .59, with a credibility interval of .54 to .64 and a confidence interval of .45 to .72. Dividing the converted mean by the converted standard deviation resulted in a z-score of 5.55.

*Subordinate support* was represented in two studies. Correction for sampling error included two data sets, had a sample size of 1,242, average sample size of 621, average correlation of .53, a standard deviation of the population of .02, and a variance due to sampling error of .001. Correction for unreliability could not be performed due to lack of data from studies.

*Task constraints* was represented in four studies. Correction for sampling error included 4 data sets, had a sample size of 1,535, average sample size of 512, average correlation of .03, standard deviation of the population of .38, and a variance due to sampling error of .002. Correction for unreliability included 4 studies and 4 data sets, had an average sample size of 410, corrected standard deviation of .44, and resulted in a

mean actual study correlation of .03, with a credibility interval of .025 to .035 and a confidence interval of -.42 to .47. Dividing the converted mean by the converted standard deviation resulted in a z-score of .07.

*Continuous learning culture* was represented in four studies. Correction for sampling error included 10 data sets, had a sample size of 936, average sample size of 94, average correlation of .17, a standard deviation of the population of .03, and a variance due to sampling error of .01. Correction for unreliability included 4 studies and 10 data sets, had an average sample size of 94, corrected standard deviation of 0.0, and resulted in a mean actual study correlation of .20, with a credibility interval of .15 to .25 and a confidence interval of .13 to .28. The z-score could not be calculated due to the value of the corrected standard deviation.

*Frequency of use* was represented in three studies. Correction for sampling error included three data sets, had a sample size of 747, average sample size of 249, average correlation of .19, a standard deviation of the population of .10, and a variance due to sampling error of .004. Correction for unreliability included 3 studies and 3 data sets, had an average sample size of 249, corrected standard deviation of .10, and resulted in a mean actual study correlation of a mean correlation of .23, with a credibility interval of .18 to .28 and a confidence interval of .06 to .39. Dividing the converted mean by the converted standard deviation resulted in a z-score of 2.24.

*Relapse prevention* was represented in 5 studies. Correction for sampling error included 11 data sets, had a sample size of 1035, average sample size of 94, average correlation of .37, standard deviation of the population of .19, and a variance due to

sampling error of .008. Correction for unreliability included 5 studies and 11 data sets, had an average sample size of 94, corrected standard deviation of .23, and resulted in a mean actual study correlation of .52, with a credibility interval of .47 to .57 and a confidence interval of .43 to .83. Dividing the converted mean by the converted standard deviation resulted in a z-score of 2.55.

*Goal setting* was represented in six studies. Correction for sampling error included 16 data sets, had a sample size of 1131, average sample size of 81, average correlation of .24, a standard deviation of the population of .19, and a variance due to sampling error of .011. Correction for unreliability included 6 studies and 16 data sets, had an average sample size of 76, corrected standard deviation of .23, and resulted in a mean actual study correlation of .28, with a credibility interval of .23 to .33 and a confidence interval of .21 to .55. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.39.

Table 2: Correction for Sampling Error

<b>Correction for Sampling Error</b>							
Independent Variable	Studies	Number of Correlations	Sample Size	Average Sample Size	Average Correlation	SD of Population	Variance due to Sampling Error
Environmental Support	24	69	14,356	208	.23	.19	.004
Supervisor Support	11	17	2,666	157	.24	.18	.006
Workplace Support/Climate	17	33	6,122	211	.23	.19	.004
Peer Support	3	3	1,108	369	.53	.10	.001
Subordinate Support	2	2	1,242	621	.53	.02	.001
Tasks Constraints	4	4	1,535	512	.03	.38	.002
Continuous Learning Culture	4	10	936	94	.17	.03	.01
Frequency of Use	3	3	747	249	.19	.11	.004
Relapse Prevention	5	11	1035	94	.37	.19	.008
Goal Setting	6	16	1131	81	.24	.19	.011

Table 3: Correction for Unreliability

Correlation for Unreliability							
Independent Variable	Studies	Number of Correlations	Average Sample Size	Corrected SD	Corrected Correlation	Credibility Interval	Z-Score
Environmental Support	24	72	203	.23	.27	.22 to .32	1.18
Supervisor Support	12	17	157	.18	.27	.22 to .32	1.52
Workplace Support/Climate	11	33	191	.22	.29	.24 to .34	1.33
Peer Support	3	3	369	.11	.59	.54 to .64	5.55
Subordinate Support	2	2	621	*	*	*	*
Tasks Constraints	4	4	410	.44	.03	.025 to .035	.07
Continuous Learning Culture	4	10	94	0	.20	.15 to .25	*
Frequency of Use	3	3	249	.10	.23	.18 to .28	2.24
Relapse Prevention	5	11	94	.23	.52	.47 to .57	2.55
Goal Setting	6	16	76	.023	.28	.23 to .33	1.39

\* = insufficient data

A moderator analysis of managerial training was performed on environmental support and included 11 studies. Correction for sampling error included 29 data sets, had a sample size of 7,956, average sample size of 274, average correlation of .27, standard deviation of the population of .18, and variance due to sampling error of .003. Correction for unreliability included 10 studies and 29 data sets, had an average sample size of 274, corrected standard deviation of .22, and resulted in a mean actual study correlation of .32, with a credibility interval of .27 to .37 and a confidence interval of .23 to .40. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.44.

A moderator analysis of non-managerial training was performed on environmental support and included 15 studies. Correction for sampling error included

42 data sets, had a sample size of 6,183, average sample size of 167, average correlation of .16, standard deviation of the population of .19, and variance due to sampling error of .006. Correction for unreliability included 15 studies and 42 data sets, had an average sample size of 155, corrected standard deviation of .23, and resulted in a mean actual study correlation of .20, with a credibility interval of .15 to .25 and a confidence interval of .12 to .27. Dividing the converted mean by the converted standard deviation resulted in a z-score of .84.

*A self-reporting moderator analysis* was performed on environmental support and included 24 studies. Correction for sampling error included 66 data sets, had a sample size of 13,620, average sample size of 216, average correlation of .23, corrected standard deviation of the population of .20, and a variance due to sampling error of .004. Correction for unreliability included 24 studies and 66 data sets, had an had an average sample size of 211, standard deviation of .23, and resulted in a mean actual study correlation of .28, with a credibility interval of .23 to .33 and a confidence interval of .21 to .35. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.18.

*A (non) self-reporting moderator analysis* was performed on environmental support and included 3 studies. Correction for sampling error included 4 data sets, had a sample size of 696, average sample of 174, average correlation of .13, standard deviation of the population of .07, and a variance due to sampling error of .006. Correction for unreliability included 3 studies and 4 data sets, had an average sample size of 174, corrected standard deviation of .09, and resulted in a mean actual study correlation of .16,

with a credibility interval of .11 to .21 and a confidence interval of .03 to .28. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.81.

*A training versus development moderator analysis* was performed with all independent variables included. Correction for sampling error for *training* included 27 studies and 82 data sets, had a sampling size of 14,891, average sample size of 182, average correlation of .25, standard deviation of the population of .20, and a variance due to sampling error of .005. Correction for sampling error for *development* included 4 studies and 10 data sets, had a sampling size of 998, average sample size of 249, average correlation of .13, standard deviation of the population of .22, and a variance due to sampling error of .004. Correction for *training* unreliability included 29 studies and 89 data sets, had an average sample size of 172, corrected standard deviation of .23, and resulted in a mean actual study correlation of .3, with a credibility interval of .25 to .35 and a confidence interval of .25 to .36. Correction for *development* unreliability included 4 studies and 10 data sets, had an average sample size of 118, corrected standard deviation of .26, and resulted in a mean actual study correlation of .16, with a credibility interval of .11 to .21 and a confidence interval of -.01 to .35. Dividing the converted mean by the converted standard deviation resulted in a z-score of 1.33 for training and .66 for development.



Table 4: Moderator Analysis Sampling Error

Moderator Analysis Sampling Error							
Moderator	Studies	Number of Correlations	Sample Size	Average Sample Size	Average Correlation	SD of Population	Variance due to Sampling Error
Managerial Training	11	29	7,956	274	.27	.19	.003
Non-Managerial Training	15	42	6,183	167	.16	.19	.006
Self-Reporting	24	66	13,620	216	.23	.20	.004
Non Self-Reporting (Supervisor/Peer)	3	4	696	174	.13	.07	.006
Training	27	82	14,891	182	.25	.20	.004
Development	4	10	998	249	.13	.22	.009

Table 5: Moderator Analysis of Unreliability

Moderator Analysis Unreliability							
Moderator	Studies	Number of Correlations	Average Sample Size	Corrected SD	Corrected Correlation	Credibility Interval	Z-Score
Managerial Training	10	29	274	.22	.32	.27 to .37	1.44
Non-Managerial Training	15	42	155	.23	.20	.15 to .25	.84
Self-Reporting	24	66	211	.23	.28	.23 to .33	1.18
Non Self-Reporting	3	4	174	.09	.16	.11 to .21	1.81
Training	29	89	172	.23	.30	.25 to .35	1.33
Development	4	10	118	.26	.16	.11 to .21	.66

### Moderator Analysis

*Hypothesis one* tested whether the managerial training showed lower levels of training transfer correlations than non-managerial training. This hypothesis was shown to be false. Managerial training provided correlation levels of .32, while non-managerial training provided correlations levels of .20 to training transfer. Managerial training had

a sample size of 7,956 and included 29 data sets. Non-managerial training had a sample size of 6,183 and included 42 data sets.

*Hypothesis two* tested whether studies that use self-reporting would show higher levels of transfer than correlations than studies that use supervisor and peer reporting ((non) self-reporting). This hypothesis was shown to be true by the analysis. Studies that used self-reporting had correlation levels of .28, while (non) self-reporting studies showed correlation levels of .16 to training transfer. Self-reporting had a sample size of 13,620, while non self-reporting had a sample size of 696.

*Hypothesis three* tested whether training would show higher levels of transfer than development activities. This hypothesis was shown to be true by the analysis. *Training* had correlation levels of .30, while *development* had correlation levels of .16 to training transfer. *Training* had a sample size of 14,891 and included 82 data sets. *Development* had a sample size of 998 and included 10 data sets.

## V. Conclusions

### Discussion

The research question posited in Chapter I, “to determine the effects of post-training variables on training transfer, specifically when measured in the work environment, and whether transfer moderators can affect training transfer”, was answered by evaluating three hypotheses in conjunction with performing four moderator analyses. The study of training transfer in the workplace has been limited in this field of study. There have been many meta-analyses in other areas such as cognitive ability, employment interviews, and personality testing, but there has been very little work done on effectiveness of training transfer (Author et al., 2003).

There were 134 studies analyzed for the inclusion of this study and 34 were accepted. The corrected correlations for the independent variables ranged from .03 to .59, while the corrected correlations for the moderator analysis ranged from .16 to .32. The use of a meta-analysis allowed for overall assessment of the independent variables and their relationship in the workplace. All the data sets were corrected for sampling error and unreliability before any analysis was performed using guidance from Hunter and Schmidt (1990). The relationship between each independent variable and training transfer was assessed and provided interesting results. The results showed positive relationships to training transfer in all independent variables with peer support (.59) having the highest correlation to training transfer followed by relapse prevention (.52) and goal setting (.28). This was similar to previous research (Toney, 2007) that had

relapse prevention the highest followed by peer support and that focused on effect size without performing any artifact corrections.

Supervisor support (.27) and workplace (.29) transfer showed modest correlations, while tasks constraint's (.03) correlation was insignificant. Subordinate support provided a .53 average correlation but correction for unreliability could not be performed due to lack of data within the studies.

### **Moderator Analysis Findings**

The moderator analysis conducted in this study does not appear to have been done before with regards to training transfer. The analysis provided new information that is meaningful to the study of training transfer in the workplace. The moderator analysis performed on managerial versus non-managerial training showed managerial training had higher levels of transfer (.32) compared to non--managerial training (.20). This is consistent with Hucznski et al. (1979), who supported higher levels of managerial training due to managers having a greater potential for autonomous action within the organizational context and being freer to introduce change. This is also consistent with studies that found that organizations just do not have the training support or capability to manage training transfer which may cause low levels of transfer in less important non-managerial training (Broad (1982) & Newstrom (1986)).

By comparing the corrected standard deviations to the mean to assess variation across studies (z-score), the result showed managerial training at 1.44 and non-managerial at .84, with two standard deviations (2.0) being the threshold to conclude the relationships are always positive (Hunter and Schmidt, 1990). The management, .23 to

.40, and non-management, .12 to .27, confidence intervals showed that overlap existed between these two moderators, meaning there may not be a distinction between the two moderators. The credibility intervals corrected this and management, .27 to .37, and non-management, .15 to .25, proved that two distinct moderators were being compared.

The findings regarding self-reporting versus supervisor and peer reporting (non self-reporting) is consistent with what one might expect with self-reporting data. As noted by Baldwin and Ford (1988), issues exists when relying on self-ratings as they tend to be inflated which makes it all the more imperative to collect data from supervisor and peer ratings. Self-reporting (.28) had almost twice the level of positive transfer as compared to supervisor and peer reporting (.16). This means that trainees rate their capabilities and long-term transfer success higher than when reported by supervisor and peers. Also, the trainees may be in a better position to assess whether the training they received was actually applicable to their jobs. The z-score for self-reporting was lower (1.18) compared to 1.81 for supervisor and peer reporting, showing more reliable training transfer results are obtained through the use of supervisors and peers. The self-reporting, .21 to .35 and other reporting, .03 to .28, confidence intervals showed that overlap existed between these two moderators, meaning there may not be a distinction between the two moderators. The credibility intervals corrected this and self-reporting, .23 to .33, and other reporting, .11 to .21, proved that two distinct moderators were being compared.

The moderator analysis performed on training and development provided interesting results. Training tends to have a short-term focus while development focuses more on broadening the individual's knowledge through formal education. Training (.30)

mean correlation showed higher levels of transfer compared to development (.16). Training's z-score (1.33) also showed a more positive relationship to training transfer as compared to development (.66), meaning that training will likely show higher levels of transfer on a consistent basis. These results seem to show that career broadening education, undergraduate or graduate studies, may provide the individual with an overall better education in a particular field, but may not enhance an individual's skill set to a level comparable to those receiving specialized training. Training on the other hand, is designed to give trainees a specific skill set and one would expect higher levels of transfer in these individuals. The training, .25 to .36 and development, -.01 to .35, confidence intervals showed that overlap existed between these two moderators, meaning there may not be a distinction between the two moderators. The credibility intervals corrected this and training, .25 to .35, and development, .11 to .21, showed that two distinct moderators were being compared.

The analysis of "environmental support" consisted of a combination of all the support variables: supervisor support, peer support, subordinate support, task constraints, continuous learning culture, workplace support, and frequency of use. Goal setting and relapse prevention was not included as these variables are not considered "support" factors. The results of this analysis, except for peer support, showed environmental support (.27) at similar levels of corrected correlation to training transfer as did the independent variables separately. The z-score for environmental support was lower than all independent variable z-scores except for task constraints (.07). This means that all the support variables combined are less likely to always show a positive relationship to

training transfer as compared to the variables independently. The confidence intervals were .21 to .33 and the credibility intervals were .22 to .32. There were 60 of 69 correlations from the original studies that fell outside the confidence and credibility intervals, meaning that error existed within those studies. Overall, the data shows there is no significant difference to training transfer when combining the support variables together but it does show there is less likelihood that a positive relationship will be maintained with training transfer when combining the variables. This is in contrast to Tracey et al. (1995), who reported organizational climate as important in influencing transfer.

### **Previous Research**

#### *Supervisor Support*

Researchers have repeatedly shown that the extent to which managers and supervisors encourage, tolerate, or discourage newly acquired skills by the trainee greatly influence the extent to which training is transferred, leading to organizational improvements (Ford, et al., 1992; Axtell, et al., 1997). Tesluk (1995) found that managers at higher levels of the organization may not have strong effects on training transfer as compared to supervisors. Brinkerhoff & Montesino (1995) also found a positive relationship between supervisor support and training transfer. They found that trainees who reported using their training skills also reported favorable support from their supervisors. Chiaburu (2005) also found positive relationships between supervisor support and training transfer.

This study does show a positive correlation between supervisor support and training transfer. The results of this study showed supervisor support among other independent variables with the fifth highest correlation level of .27 to training transfer, with a z-score of 1.52. These results are modest at best and do not seem to show that supervisor support provides any advantage over the other variables. The z-score is less than two standard deviations and therefore a positive relationship cannot always be assumed. The confidence intervals were .17 to .37 and the credibility intervals were .22 to .32. There were 10 of 17 correlations from the original studies that fell outside the confidence intervals and 15 of 17 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies.

This is consistent with Awoniyis (2002) who found that there was not enough evidence to support the notion that supervisor support enhances training transfer. Awoniyis (2002) also found lower levels of correlation (.11) to training transfer that is consistent with this study. While supervisor support provided a .27 correlation, it ranked fifth among nine variables. Chiaburu (2005) did find high levels of correlation to training transfer when supervisor support was being compared to continuous learning culture. But this reasoning would not enhance the results of this study because continuous learning culture results provided the third lowest level of training transfer at .20. If these same variables were compared it may also provide similar results as Chiaburu, but those results would not enhance supervisor support's ranking among variable or correlation to training transfer. Again, the results do provide a positive correlation to training transfer



as stated in many other studies but it also validates other studies by the fact that supervisor support show little advantage over other independent variables.

### *Peer Support*

Studies infrequently reported peer support separately in their data sets. This variable was usually mentioned and combined with other variables such as subordinate and supervisor support. Only three studies and data sets were found for this study. Sampling error and unreliability testing was performed as with the rest of the studies and the results were interesting. Peer support provided the highest level of correlation at .59 and had the highest z-score of 5.55. The sample size of 1,108 combined with only three data sets may be reason to question the sampling error and reliability of the testing. Hunter and Schmidt (1990) discuss sampling error with small sample sizes but fail to give specific numbers or ball park samples as a guide. The z-score also shows an extremely high positive relationship to training transfer as compared to other variables. The confidence intervals were .45 to .72 and the credibility intervals were .54 to .64. There was one of three correlations from the original studies that fell outside the confidence and credibility intervals, meaning error may have existed within that study.

The resistance to completely accept these finding is not totally unfounded. For example, Cromwell and Kolb (2004) found positive relationships between peer support and training transfer but point out that due to the type of training, work collaboration and networking among trainees was encouraged and therefore positive peer support results was not surprising. Also, Enos, Kehrhahn, and Bell (2003) found very little correlation between peer support and training transfer. These two studies, one possibly unreliable

and the other showing weak correlations, made up two of the three studies within this data set. Based on these facts, it only seems logical to question the outcome of this independent variable's results.

#### *Workplace Support / Transfer Climate*

Workplace support / transfer climate (.29) had the second highest correlation to training transfer of all the support variables. Peer support was the only variable to provide higher levels of correlations and as discussed above, those results may be suspect.

Tannenbaum, Cannon-Bowers, Salas, and Mathieu (1993) noted in their research that work environment factors are often overlooked on training transfer. This does not seem to be the case with regards to training transfer in the workplace. There were more studies interested in workplace support (17) as compared to the other variables. This provided a data set of 33 and a sample size of 6,082. The z-score yielded a positive relationship of 1.33. The amount of data found and corrected for sampling error and reliability, seems ample enough to assume a higher level of confidence in the results. The confidence intervals were .20 to .37 and the credibility intervals were .24 to .34. There were 23 of 29 correlations from the original studies that fell outside the confidence intervals and 26 of 29 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies.

Past findings (Burke & Baldwin, 1999 and Tziner & Haccoun 1991) yielded positive results with regards to workplace climate and training transfer but Cheng's (2000), research yielded negative results in his study. Lim and Morris (2006) also found that organizational climate among other variables, is closely correlated and influenced by

the trainees' perceived learning and learning transfer. Tesluk et al. (1995) found that climate significantly contributed to transfer. These results were supported by previous research from Rouiller and Goldstein (1993) and Tracey et al. (1995).

### *Relapse Prevention*

Relapse prevention had the second highest correlation level to training transfer of .52, while goal setting had a level of .28 and environmental support's correlation to training transfer was at .27. This is consistent with previous studies where relapse prevention was termed a "powerful influence" that may help to enhance transfer of training (Marx, 1982; Noe & Ford, 1992). Sample size could account for some of the difference due to sampling error (Hunter and Schmidt, 1990). Relapse prevention had a lower sample size (1035) than many of the other variables but after comparing these variables sample size to mean correlation, there does not seem to be any evidence to support lower sample size accounting for the higher mean correlation of relapse prevention. The results from this study also revealed a z-score of 2.55, exceeding Hunter and Schmidt's (1990) threshold (2.0) that concludes the relationship to always be positive. The confidence intervals were .43 to .83 and the credibility intervals were .47 to .57. There were 6 of 9 correlations from the original studies that fell outside the confidence intervals and 8 of 9 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies.

The positive correlation is consistent with Burke (1997) who found correlations between relapse prevention and a trainee's ability and desire to transfer. These results further validate the use Marlatt and Gordon's (1980) behavioral model that gave

managers cognitive and behavioral skills in order to prevent full blown relapses in training behavior (Marx, 1982). Tziner et al. (1991) study revealed positive results that showed that trainees who received relapse prevention training were more successful in transferring. Additionally, Tziner (1991) found that those who were in relapse prevention groups had attained higher learning scores as opposed to those not exposed to relapse prevention.

### *Goal Setting*

Goal setting had the smallest sample size of all the independent variables but included the third highest number of studies (6) and third highest number of data sets (16). The results showed a positive relationship (1.39) to training transfer with an overall mean correlation of .38. The confidence intervals were .21 to .55 and the credibility intervals were .23 to .33. There were 8 of 10 correlations from the original studies that fell outside the confidence intervals and 9 of 10 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies. Wexley and Baldwin (1986) found that using goal setting alone provided positive results to transfer. Morin and Latham (1986) found that using goal setting alone is not an effective means for training transfer if no other methods are included. Gist (2005) found significantly higher levels of self-efficacy in participant involved in cognitive modeling and idea generation than those sitting in a lecture environment and practice alone method. Brown (2005) found that developing goals while participants are learning a new skill is not effective at increasing training transfer.

### *Tasks Constraints*

Tasks constraints provided limited data sets and results. There were only four studies and four data sets included within this variable but a decent size sample of 1,535 was obtained. The positive relationship to training transfer was insufficient at .07. The confidence intervals were -.41 to .47 and the credibility intervals were .025 to .035. None of the three correlations from the original studies fell outside the confidence intervals while 3 of 3 fell outside the corrected credibility intervals, meaning that error may have existed within those studies. Tracey et al. (1995) suggest that there may be a direct correlation between tasks constraints and pretraining motivation. Colquitt et al. (2000) found a positive relationship between tasks constraints and training transfer. Xiao (1996) results indicated the perception of working in a particular environment did not change training transfer behavior.

### *Subordinate Support*

Subordinate support was another one of the variables that was rarely distinguished among other support variables. If subordinates were mentioned in studies it was usually lumped in with supervisor and peer support. There were only two studies found that reported on subordinate support and had a data set of two. The sample size was 1,242. Subordinate support had an average correlation of .53 but due to limited data, it was not possible to obtain a mean correlation or reliable positive correlation. Baldwin & Ford (1988) and Wexley & Baldwin (1986) did find positive relationships between subordinate support and training transfer. If trainees do not feel they are receiving support from

subordinates, they are less likely to put effort into the learning process and transfer will be diminished (Baldwin & Ford, 1988).

#### *Frequency of Use*

There was limited amount of data pertaining to frequency of use. Three studies and three data sets were obtained for a combined sample size of 747. The positive relationship (z-score) was 2.24, meaning that one can conclude the relationship between frequency of use and training transfer will always be positive. The confidence intervals were .06 to .39 and the credibility intervals were .18 to .28. There was 1 of 3 correlations from the original studies that fell outside the confidence intervals and 2 of 3 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies. Ford et al. (1992) found that the opportunity to use what has been learned and training transfer go hand in hand. Axtell et al. (1997) also found that the opportunity to use will provide individuals more control and autonomy in their jobs.

#### *Continuous Learning Culture*

The difference between continuous learning culture and other organizational support variables was not distinguishable in many studies. Distinguishing between continuous learning culture and variables such as transfer climate and supervisor support became a task of splitting hairs. The studies found to fit under the heading of continuous learning culture could have as well been placed among other variables and eliminated this variable. Continuous learning culture was included in four studies with a total data set of 10. The results provided a positive relationship to training transfer with a mean correlation of .20. The exact relationship (z-score) was not able to be calculated as the

mean variance results were  $-.01$ . The confidence intervals were  $.13$  to  $.28$  and the credibility intervals were  $.15$  to  $.25$ . There were 6 of 10 correlations from the original studies that fell outside the confidence intervals and 9 of 10 that fell outside the corrected credibility intervals, meaning that error may have existed within those studies. Chiaburu (2005) found a  $.28$  correlation of continuous learning culture to training transfer but that results disappeared when supervisor support was included in the equation. Tracey et al. (1995) behavioral study found continuous learning culture can have positive effects if applied in the proper training setting.

### **Significance of Research**

The results from the independent variables validated many previous studies with regard to positive and negative correlations. There does not seem to be any moderator analysis performed comparing the factors as was done within this study and this could provide value to research within this field. The culmination of all support factors into a data set termed environmental support, showed that there is little to no higher level of correlation to training transfer when combining variables as comparing them separately.

The management analysis showed that managers do exhibit higher levels of transfer than do non-management trainees with regards to training transfer in the workplace. This information could help validate the position that managers are in a better position within the organization to facilitate transfer. This also shows that further investigation may be necessary within organization's non-managerial training program to validate funds are being provided and spent wisely.

The reporting analysis validated that self-reporting has higher levels of training transfer compared to when supervisors and peers assess the trainees. This may add weight into the concept of self-reporting results being inflated. The training and development analysis also provided benefit to the training community by showing that specialized training will yield higher levels of training transfer as compared to career broadening.

### **Limitations**

There are several limitations to this study. First, the inclusion criteria for acceptance of articles limited the number of studies that could be included. The purpose of this was to ensure commonality among articles but the negative effect was a 73% exclusion rate. There were many excellent training transfer articles within the overall data set but in order to validate the study, stringent guidelines were put in place. For instance, the independent variables within many studies were some what similar to our criteria but made interpretation a judgment call. Some studies also combined our independent variables into one criterion (e.g., climate) and made it difficult to discern where the articles fit within the data set.

Second, some of the independent variables were difficult to locate (e.g., relapse prevention, goal setting, & peer and subordinate support) as related to training transfer. The restrictions within this study further limited an already small data set. For example, supervisor support yielded 11 studies, peer support (3), subordinate support (2), workplace support/transfer climate (18), relapse prevention (5), goal setting (6), task constraints (4), continuous learning culture (4), and frequency of use (3).



Third, this study was limited by the sample size due to the criteria mentioned above and this presented sampling error issues. The formulas used to correct the artifacts in Hunter and Schmidt (1990) is designed to correct correlations with sample sizes over a thousand. Therefore, although these formulas correct sampling error, sampling error may still exist where the N is less than a thousand.

### **Recommendations and Future Research**

There are several opportunities for future research in the area of a meta-analysis on training transfer. First, if more data that meets the criteria of this study could be found in areas such as goal setting and relapse prevention, a moderator analysis could be performed to test the effects of these two variables by comparing and removing support variables. This could help to determine what support variables have the greatest effect on goal setting and relapse prevention.

Next, an area for future research would be to compare these results with the data from the environmental support database to see if support elements or behavioral elements have a greater effect on training transfer.

Finally, future research could look at the possibility of loosening the workplace criteria and include studies that gather feedback from trainees immediately after training. This data could be compared with workplace data, as in this study, to see if trainees' perceptions change over time.

### **Conclusions**

This research can help organizations to determine the influences that will affect training transfer. Organizations can use this information to determine how to allocate

funds for training and what particular factors to use to increase the chances of long-term transfer within their business. There are billions of dollars being spent training employees with limited return on employer's investments. This research may help close the gap and provide senior management with more refined guidance for getting the most out of their dollars spent. For example, this research has also shown that individuals in managerial training have higher levels of long-term transfer as opposed to non-management training. There have been many possible explanations for these results but it still provides senior managers on a limited budget to get the most out of their money. It also can help the organization focus on those non-management employees and try to enhance their ability to transfer simply by paying more attention to subordinates. These results show that organizations need not focus on one particular variable to increase transfer but to put trainees in an environment where all of the factors can play a role. Results of this study also suggest that organizations need to investigate the method data is reported (self-reported, supervisor or peer reported) to avoid inflated results.

Hopefully, the information from this study can be used to further research in the field of training transfer. Also, managers and supervisors may be able to use this research to tailor their training programs to benefit themselves and get the best results for the dollar spent.

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