

DISSERTATION

MAKING TRAINING STICK: A CLOSE EXAMINATION OF HOW TRAINEE  
READINESS, SUPERVISOR SUPPORT, AND PRACTICE FOSTER TRANSFER IN A  
MOBILE TECHNOLOGY-BASED TRAINING PROGRAM

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## ABSTRACT

### MAKING TRAINING STICK: A CLOSE EXAMINATION OF HOW TRAINEE READINESS, SUPERVISOR SUPPORT, AND PRACTICE FOSTER TRANSFER IN A MOBILE TECHNOLOGY-BASED TRAINING PROGRAM

Although today's organizations are investing copious amounts of time, money, and resources on employee learning and development, trainees often fail to apply their learning and skills on the job, bringing into question the true value of organizational training. In an attempt to improve understanding of the key individual and organizational elements that impact training success, this research explored how trainee readiness, supervisor support, and practice foster transfer in a mobile technology-based training program. Data were collected at three different time points (beginning, middle, and end of training) from 201 frontline workers who participated in an innovative, long-term safety training program. Findings revealed significant relationships between three trainee readiness characteristics and post-training outcomes, with post-hoc analyses suggesting that training self-efficacy and motivation to learn were the best predictors of training effectiveness. Unfortunately, results failed to support the expected interaction between supervisor support (operationalized as safety transformational leadership behaviors) and trainee readiness characteristics in boosting training success. However, follow-up tests revealed strong main effects between safety transformational leadership behaviors and post-training outcomes, with the strongest support for two key supervisory behaviors: individualized consideration and contingent reward. Finally, measurement issues prevented the exploration of the role of practice

in a real-world, organizational training program. Study implications, limitations, and opportunities for future research on boosting ‘training stickiness’ are discussed.

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## TABLE OF CONTENTS

INTRODUCTION .....	1
Training Transfer Models, Meta-Analyses, and Literature Reviews.....	7
Accelerators of Training Transfer.....	11
Trainee Readiness Characteristics .....	11
Training Self-Efficacy.....	13
Learning Goal Orientation .....	16
Motivation to Learn .....	18
The Work Environment .....	21
Supervisor Support.....	24
Safety Transformational Leadership.....	27
Interactions between Trainee Readiness and Supervisor Support .....	30
Practice.....	34
A Mobile Technology-Based Training Program .....	37
METHOD .....	42
Participants.....	42
Procedure .....	43
Measures .....	44
RESULTS .....	50
Main Effects.....	50
Interaction Effects.....	53
Additional Analyses.....	57
Mediation Effects.....	59
DISCUSSION .....	60
Implications of Hypotheses 1-3 .....	63
Implications of Hypotheses 4-6 .....	67
Implications of Research Question 1 .....	70
Limitations .....	72
Future Research .....	76

Summary .....	78
REFERENCES .....	96
APPENDIX.....	113

LIST OF TABLES

Table 1. Means, standard deviations, and zero-order correlations for all study variables .....82

Table 2. Hierarchical regression analyses of training self-efficacy on learning and transfer.....84

Table 3. Hierarchical regression analyses of learning goal orientation on learning and transfer..85

Table 4. Hierarchical regression analyses of motivation to learn on learning and transfer.....86

Table 5. Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting learning.....87

Table 6. Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting training transfer 1.....88

Table 7. Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting training transfer 2.....89

Table 8. Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on learning.....90

Table 9. Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on training transfer 1.....91

Table 10. Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on training transfer 2.....92

Table 11. Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting learning.....	93
Table 12. Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting training transfer 1.....	94
Table 13. Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting training transfer 2.....	95

## LIST OF FIGURES

Figure 1. Proposed model of the effects of trainee readiness, supervisor support, and practice on trainee outcomes.....	80
Figure 2. Summary of the pre-, within-, and post-training goals and strategies from Machin (2002).....	81

## INTRODUCTION

*Does training really work?* For years, leaders and employees have been asking this question as organizations continue to invest extensive resources towards employee learning and development for an often unclear or unknown “return-on-investment.” In fact, recent estimates from the American Society for Training and Development (Green & McGill, 2011) suggest that in 2010 alone, U.S. organizations spent approximately \$170 billion dollars on employee learning opportunities. These data clearly demonstrate the high value that many organizations place on workplace training and development. Yet, at the same time, there is still uncertainty around the long-term benefits and sustained transfer of these types of expenditures (e.g., Blume, Ford, Baldwin, & Huang, 2010; Kozlowski & Salas, 1997; Saks, 2002).

With a growing consensus that investing in human capital resources (i.e., people) is necessary for maintaining competitive advantage (e.g., Becker, Huselid, & Ulrich, 2001; Pfeffer, 1994), *training* is one avenue many companies pursue to enhance employee and organizational performance (Dean, Dean, & Rebalsky, 1996). According to Salas, Wilson, Priest, and Guthrie (2006; as cited in Grossman & Salas, 2011), training is “the systematic acquisition of knowledge, skills and attitudes that lead to improved performance in a specific environment” (pp. 103-104). In the academic community, the value of organizational training has been widely demonstrated (e.g., Aguinis & Kraiger, 2009; Arthur, Bennett, Edens, & Bell, 2003; Birdi et al., 2008; Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012; Taylor, Russ-Eft, & Taylor, 2009; Tharenou, Saks, & Moore, 2007). For example, meta-analytic findings from Arthur et al. suggest that training has a positive organizational impact on employee job behaviors and performance (mean effect size of .62). Additional findings reported by Aguinis and Kraiger (2009) highlight how

employee training and development efforts provide long-term benefits to individual employees (through increased declarative and procedural knowledge), work teams, and organizations as a whole (through improved productivity and profitability). Furthermore, recent research from Grossman and Salas (2011) indicated that an inadequately trained workforce has been linked to costly errors, legal challenges, and injuries on the job. In fact, the National Safety Council (2011) reported that in 2009 alone, organizations spent over \$168 billion dollars on unintentional employee injuries and accidents. As the data and dollars suggest, companies and their people can benefit immensely from well-designed training programs.

On one hand, we know that training is effective because these investments can positively affect individuals, teams, and organizations. Yet, the long-term influence and value of training is diminished if individuals fail to transfer training knowledge and skills on the job (Aguinis & Kraiger, 2009). This distinction is important because in the past, the effectiveness of training efforts was assessed by the extent to which individuals *learned* new knowledge and skills in training, but today, there is an understanding that *training transfer* on the job is the critical indicator of training success (e.g., Baldwin & Ford, 1988; Ford & Weissbein, 1997; Grossman & Salas, 2011; Salas & Cannon-Bowers, 2001; Tannenbaum & Yukl, 1992).

Over the last several decades, training transfer has received broad empirical attention and is most commonly described as the extent to which knowledge and skills gained in training are transferred to the workplace, resulting in meaningful on-the-job improvements (e.g., Broad & Newstrom, 1992; Goldstein, 1980; Goldstein & Ford, 2002; Kozlowski & Salas, 1997; Milheim, 1994). A training dilemma thus emerges when organizations invest billions of dollars on employee training and development yet transfer doesn't occur (Grossman & Salas, 2011). In fact, a meta-analysis from Alliger and Janak (1989) explored the relationships between Kirkpatrick's

four levels of training criteria: reactions, learning, behavior, and results. The authors found a low correlation between learning and behavior ( $r = .13$ ), suggesting there is a weak relationship between the knowledge and skills trainees learn in training and on-the-job behavioral changes. An updated meta-analysis from Alliger, Tannenbaum, Bennett, Traver, and Shotland (1997) reported a similar (weak) correlation between learning and behavior outcomes ( $r = .18$ ). Additionally, recent findings from Saks and Belcourt (2006) demonstrated that 62% of trainees experience positive transfer immediately after training, 44% experience positive transfer six months after training, and only 34% engage in transfer on the job approximately one year after training. These transfer numbers highlight the diminishing return-on-investment of training over time.

Failure to apply training at work, also known as the ‘transfer problem’ (e.g., Baldwin & Ford, 1988; Ford & Weissbein, 1997; Burke, 2001), is a real and growing concern among both academics and practitioners. Moreover, an additional training dilemma emerges when an assortment of training formats, methodology, and instructors are being utilized across different levels of employees and various types of organizations. With so much variability in training processes and the high transfer failure rate, there is a clear need to enhance our understanding of the individual and organizational factors that help foster sustained training success.

The goal of my research is to investigate “why training works” (rather than “does training work?”). This question has both theoretical and practical value. Theoretically, such research can help strengthen our comprehensive understanding of the factors that influence training effectiveness. Practically, more evidence-based recommendations for both trainers and training designers can help improve the overall quality of training services (e.g., Tracey, Tannenbaum, & Kavanagh, 1995). In this study, I will explore how trainee readiness, supervisor support, and

practice on the job, affect trainee outcomes in the context of a safety training program that leverages mobile learning technology (see Figure 1). The current research contributes to the training literature in several ways.

First, although it is well-established that supervisor support for training (e.g., Brinkerhoff & Montesino, 1995; Broad & Newstrom, 1992; Burke & Baldwin, 1999; Clarke, 2002) and supervisor support for transfer (e.g., Broad, 1982; Cromwell & Kolb, 2004; Foxon, 1993) are related to training effectiveness, there is still a lack of clarity about the specific types of supportive actions that are most critical (e.g., Baldwin & Ford, 1988; Foxon, 1997; Quiñones, Ford, Segó, & Smith, 1995) and the role of supportive supervisors in successful training outcomes (Kraiger, 2003). In other words, there is a need to better operationalize the supervisor support construct in the training context so that we can more deeply understand which supervisory behaviors matter most (Clarke, 2002). Additional research on training-related supervisor support has both theoretical value (helping us clarify our measurement of the supervisor support construct) and practical value (giving organizational leaders specific ideas on how they can better support trainees before, during, and after training). In the current study, I operationalize supervisor support in terms of transformational leadership behaviors (specific to safety), which will be discussed in more detail throughout this manuscript.

Next, the current study contributes to the literature by expanding the nomological network of safety transformational leadership. Safety transformational leaders are individuals who engage in transformational leadership behaviors, but with a goal of fostering positive safety-related attitudes and behaviors at work (Mullen & Kelloway, 2009). As a relatively new construct, there is limited empirical evidence on safety transformational leadership (see Barling, Loughlin, & Kelloway, 2002; Kelloway, Mullen, & Francis, 2006; Mullen & Kelloway, 2009 for

exceptions). Thus far, extant research has explored the following safety transformational leadership outcomes: Occupational injuries (Barling et al., 2002; Kelloway et al., 2006), safety-related events (Mullen & Kelloway, 2009), and leader and employee safety-related outcomes like safety attitudes, intentions to promote safety, and leader self-efficacy (Mullen & Kelloway, 2009). In the current study, I examine how safety transformational leadership behaviors accelerate two indicators of training success: learning and transfer. To the best of my knowledge, no empirical research has directly explored the influence of safety transformational leadership behaviors on the effectiveness of a safety training program. Such research can: (a) Shed light on how supervisors (positively or negatively) affect training success; and (b) inform recommendations for organizations on how to best support trainees.

Additionally, in the training literature there has been an ongoing investigation regarding the individual and environmental characteristics that affect training transfer (Baldwin & Ford, 1988; Colquitt, LePine, & Noe, 2000; Quiñones, 1997). In terms of individual differences, existing evidence points to the idea that certain people may be more 'ready' for training, and thus more likely to engage in and learn from developmental experiences (e.g., Baldwin, Ford, & Blume, 2009; Burke & Hutchins, 2007). As such, the likelihood of training success may increase when one accounts for individual difference factors (Mathieu & Martineau, 1997). Furthermore, with mixed results in the literature regarding the relationship between supervisor support and training transfer (e.g., Axtell, Maitlis, & Yearta, 1997; Facticeau, Dobbins, Russell, Ladd, & Kudisch, 1995; van der Klink, Gielen, & Nauta, 2001), there are likely other mechanisms (i.e., moderating variables) that may help explain these findings (Pidd, 2004). In the current study, I explore how trainee readiness factors interact with supervisor support to predict trainee

outcomes. In doing so, I hope to clarify some of the boundary conditions of the support – transfer relationship.

Fourth, there have been calls in the research literature to further investigate how technology is influencing the way we train people in the workplace (e.g., Baldwin et al., 2009). Although today's organizations are incorporating technology-delivered instruction (TDI) in learning and development initiatives (e.g., Aguinis & Kraiger, 2009; Green & McGill, 2011; Patel, 2010), the research on the effectiveness of technology-based training approaches has lagged behind organizational reality (Brown, 2001; Welsh, Wanberg, Brown, & Simmering, 2003). Additionally, a new trend in TDI includes training that leverages mobile technology, which has been dubbed the new frontier for training delivery (Sharples, 2000). As noted by Abernathy (2001), mobile learning, or m-learning, approaches utilize small personal devices to deliver learning content, combining the benefits of personalized learning and on-demand learning (e.g., de-Marcos et al., 2010; Peng, Su, Chou, & Tsai, 2009). The current study investigates an innovative mobile learning approach for training organizational employees. This training program was developed based on evidence-based learning principles, which are key elements in well-designed and highly effective training (Aguinis & Kraiger, 2009). In terms of contributions, the current research is the first transfer study that explores how to maximize training effectiveness in a tablet-based, organizational training program.

Finally, this study explores the role of practice in the transfer process. Dating back to the first comprehensive empirical review of the training transfer literature, Baldwin and Ford (1988) proposed three types of training inputs which influence the transfer process: trainee characteristics, training design, and the work environment. Specifically in terms of training design, the authors argued that when individuals have opportunities to practice what they learned

in training on the job, they are more likely to transfer that learning (Baldwin & Ford, 1988). Further, a meta-analysis on practice by Arthur, Bennett, Stanush, and McNelly (1998) demonstrated that when individuals did not practice tasks learned in training, they were more likely to experience substantial skill decay. Taken together, there is empirical support for practice as an important element in the training transfer process. Yet, while recent publications demonstrate a positive link between practice and training transfer, these findings are often qualitative in nature (e.g., literature reviews, case studies, interviews; see Burke & Hutchins, 2007; Clarke, 2002; Gilpin-Jackson & Bushe, 2007; Lim & Johnson, 2002; Salas et al., 2006). Moreover, as suggested by Arthur et al. (1998), “the use of more ‘real-world’ tasks in the study of complex skill acquisition and retention should be seriously considered by future research” (p. 92). Thus, in the current study I aim to contribute to the literature by testing the effects of practice in a field study focused on the acquisition of complex knowledge and skills (related to safety).

To begin, I will provide a general overview of the training transfer literature, and then discuss how several trainee readiness characteristics, supportive supervisor behaviors, and practice, influence trainee outcomes in a mobile technology-based training program. First, I will discuss one of the critical markers of training success: training transfer.

### **Training Transfer Models, Meta-Analyses, and Literature Reviews**

Training transfer is the key success criterion in any training program (Milheim, 1994). That is, when participants continuously apply the knowledge and skills learned in training to their work environments over time, the organization as a whole is likely to experience positive changes and enhanced performance (Kozlowski, Brown, Weissbein, Cannon-Bowers, & Salas, 2000; Kozlowski & Salas, 1997). Over the last several decades, numerous training researchers

have developed and tested empirical and conceptual models related to training transfer (e.g., Alvarez, Salas, & Garofano, 2004; Baldwin & Ford, 1988; Cannon-Bowers, Salas, Tannenbaum, & Mathieu, 1995; Foxon, 1993; Noe, 1986; Milheim, 1994). I will begin by discussing the seminal work on training transfer from Baldwin and Ford (1988).

Baldwin and Ford's (1988) article gives us the first all-inclusive review and critique of the training transfer literature, as well as a model based on their examination of over 60 articles from 1907-1987. To date, this model of training transfer is the most cited in the literature (Brown & Sitzmann, 2011). Baldwin and Ford provided a conceptual framework with key factors they believed strongly influence the transfer process. These factors included: training inputs, training outputs, and conditions of transfer. Training inputs are described as those factors which likely affect the success of training including components like training design (incorporation of critical learning principles, sequencing of material, and the content itself), trainee characteristics (the abilities, skills, motivation, and personality traits of the learners), and work environment characteristics (supervisor and peer support, opportunity to perform learned skills at work). Training outputs include the anticipated outcomes associated with training including how much participants learned during the program (learning) and how much learning they retained over time (retention). Finally, conditions of transfer highlight the criterion issue in the training literature and the need to focus our efforts on how to best measure the transfer construct including transfer generalization (the extent to which knowledge and skills gained in training are applied to different settings beyond the training environment) and transfer maintenance (the extent to which knowledge and skills gained in training persist over time). Overall, Baldwin and Ford's (1988) seminal article laid the conceptual foundation for years of empirical work on training transfer.

In addition to the work from Baldwin and Ford, there have been numerous other models related to training transfer including the following: Noe (1986), who created a model of different motivational and situational influences of training effectiveness; Foxon (1993), who conceptualized transfer as a five stage process (including intentions, initiation, partial transfer, conscious maintenance, and unconscious maintenance), instead of an end result of training; Milheim (1994), who provided a comprehensive transfer model, specifically for instructional designers and trainers, that included three different stages of transfer (pre-training, training, and post-training) and related strategies; Cannon-Bowers et al., (1995), who developed a comprehensive model of training effectiveness that included both work environment and individual characteristics, taking a longitudinal perspective by considering influences before, during and after training; and Alvarez et al. (2004), who developed an integrated model of training evaluation and effectiveness which included components related to training content and design, changes in learners, and organizational payoffs. In the current study, I will leverage an empirical training transfer model from Machin (2002).

Machin (2002) developed an integrated model that included transfer strategies across multiple levels (individual, team, organization) and multiple time points (pre-training, during training, and post-training). Prior theoretical work contributing to Machin's model included research by Broad and Newstrom (1992; emphasized the three transfer stages; before, during, and after training), Kozlowski and Salas (1997; proposed a three-level model of transfer including the individual, team/unit, and organizational level), Thayer and Teachout (1995; highlighted the importance of transfer climate and transfer-enhancing efforts throughout the training process), and Holton (1996; proposed three major training outcomes including trainee learning, trainee performance, and organizational-level results, and the various intervening

variables that affect those outcomes). Taken all together, Machin (2002) synthesized the most recent transfer research and as a result, identified key training strategies that help boost transfer effects before, during, and after training (see Figure 2 for his complete model). Of particular importance, Machin believed that training success was a by-product of a variety of different internal and external factors. In other words, Machin's model provides great insight about how to increase the probability of transfer success utilizing a variety of evidence-based approaches and interventions across different stages in the training process. As such, the current study utilizes Machin's (2002) integrated transfer model to guide hypothesis development.

The models described above provide a quick overview of some of the more prominent empirical and conceptual frameworks related to training transfer. In addition to these training transfer models, researchers have also conducted meta-analyses and literature reviews to clarify the most important elements linked to training success. Specifically, reviews from Ford and Weissbein (1997), Burke and Hutchins (2007), Baldwin et al. (2009), Blume et al. (2010) and Grossman and Salas (2011) have provided deep insights regarding 1) the best trainee, training design and work environment factors that positively influence outcomes of training, and 2) gaps in the transfer literature and areas ripe for future development. In particular, the current research will address several concerns noted in these reviews including the need to: study how trainee and work environment factors interact to predict training effectiveness (discussed in Ford & Weissbein, 1997); explore the impact of goal orientation on the training transfer process (discussed in Burke & Hutchins, 2007); more deeply investigate how trainee readiness for training is related to transfer (discussed in Baldwin et al., 2009); better understand the effectiveness of technology in the training context (discussed in Baldwin et al., 2009); and identify the most critical predictors of training success since it is unrealistic to expect

organizations will embed every possible element into their training curriculum (discussed in Blume et al., 2010; Grossman & Salas, 2011).

Overall, empirical models, comprehensive reviews, and meta-analyses on training transfer have emerged in the literature in recent years. Although we have made great strides to enhance our understanding of the training transfer nomological network, gaps still exist and the current study aims to address a few of these limitations. More specifically, my research strives to: (1) Understand key trainee readiness factors that influence training outcomes, (2) operationalize specific supervisory support behaviors that matter in the training process, (3) assess how trainee readiness and supervisory support interact to influence training success, and (4) examine training transfer within the context of a mobile technology-based training program. In the following sections, I will discuss a variety of elements that help boost training ‘stickiness’.

### **Accelerators of Training Transfer**

#### **Trainee Readiness Characteristics.**

In their seminal work on training transfer, Baldwin and Ford (1988) proposed a conceptual model of transfer that included individual difference variables as predictors in the training transfer process. Specifically, Baldwin and Ford suggested that certain trainee characteristics had a strong influence on training transfer, including the abilities, skills, motivation, and personality traits learners bring with them to training. In the twenty-five years since this original research, there has been widespread acceptance that trainee characteristics are important accelerators of transfer success (Burke & Hutchins, 2007). For example, after examining the empirical and conceptual models of transfer that have recently emerged in the literature, it is clear that many researchers highlight the role of individual difference factors on

training transfer outcomes (e.g., Alvarez et al., 2004; Cannon-Bowers et al., 1995; Foxon, 1993; Machin, 2002; Milheim, 1994; Noe, 1986).

More specifically, Machin's (2002) transfer model incorporates three different stages of transfer: pre-training, during training, and post training. Machin proposed that before training even starts (during the pre-training stage), it is critical to enhance individual readiness for training. Maximizing trainee readiness helps ensure that: (1) Individuals are prepared to engage fully in the learning experience, and (2) training resources are distributed to those who will benefit most from development. Furthermore, the latest qualitative and quantitative training transfer reviews also emphasize that individual differences significantly affect training transfer (Baldwin et al., 2009; Blume et al., 2010; Burke & Hutchins, 2007; Ford & Weissbein, 1997; Grossman & Salas, 2011). Thus, the evidence is clear that trainee characteristics explain a considerable amount of the variance in training outcomes (van der Klink et al., 2001).

Theoretically, my study aims to contribute to the literature by providing additional empirical support for the pre-training – transfer links proposed in Machin's (2002) integrated model of transfer, but within the context of a mobile technology-based training program.

Current evidence suggests that the extent of transfer is often pre-determined by each individual learner who enters a training program with certain expectations, motivations, and attitudes (Baldwin et al., 2009). As such, despite the quality of the actual learning experience, the individual characteristics that learners possess likely have a huge impact on whether or not training is effective. Two theoretical arguments that support this idea come from the literature on readiness for change and readiness for training. Readiness for change has been defined by Holt, Armenakis, Harris, and Field (2007) as “the extent to which an individual or collection of individuals is cognitively and emotionally inclined to accept, embrace, and adopt a particular

plan to purposefully alter the status quo” (p. 326). Readiness is oftentimes revealed in learner attitudes and motivation related to the intended change (Baldwin et al., 2009). Such attitudes and behaviors can affect learners in one of two ways: (1) They help learners adopt a specific change strategy, or (2) they foster greater resistance to the change process (Holt et al., 2007). Whether or not individuals are prepared to participate, change, and learn during training has training transfer implications.

Furthermore, the training literature has also explored the construct of readiness for training, which refers to whether or not an individual possesses the necessary aptitudes, attitudes, and skills that will help him/her benefit from a learning experience (Baldwin et al., 2009). In other words, individuals enter a training program with varied levels of readiness because each learner brings unique attitudes, motivations and expectations with him/her to training (Tannenbaum, Cannon-Bowers, Salas, & Mathieu, 1993). Together, these readiness characteristics determine an individual’s “trainability” by either facilitating or interfering with one’s ability to be successful in learning (Cannon-Bowers et al., 1995). While in the past, researchers may have assumed that each learner comes to training with the same likelihood of benefiting from the experience (Salas, Cannon-Bowers, Rhodenizer, & Bowers, 1991), there is growing evidence that pre-training factors like *trainee readiness* can have a huge influence on both training and job-related outcomes (e.g., Tannenbaum et al., 1993).

Overall, the constructs of readiness for change and readiness for training highlight why it is so important to assess the individual characteristics trainees bring with them to the learning environment. In the current study, I will focus on three trainee readiness factors that have demonstrated strong, consistent relationships with transfer including training self-efficacy,

learning goal orientation, and motivation to learn. First, I will discuss the role of training self-efficacy in the training context.

### ***Training Self-Efficacy***

Today, it is common practice to assess the role of self-efficacy within the context of training transfer (e.g., Brown, 2005; Gaudine & Saks, 2004; Kozlowski, Gully, Brown, Salas, Smith, & Nason, 2001; Schwoerer, May, Hollensbe, & Mencl, 2005). As an essential component in social cognitive theory, self-efficacy is defined as an individual's belief in his or her ability to achieve a certain level of performance (Bandura, 1986). Two main types of self-efficacy are frequently assessed: general self-efficacy and specific self-efficacy. While general self-efficacy reflects an individual's confidence in his/her capacity to perform at a high level across different contexts (Judge, Erez, & Bono, 1998), specific self-efficacy refers to an individual's self-belief that he/she has the necessary motivation, cognitive resources, and performance ability to meet the specific demands of a given situation (Wood & Bandura, 1989). When choosing how to best operationalize self-efficacy, Bandura and Adams (1977) have suggested tailoring measures to the specific domain being studied. This argument has received extensive empirical support, with research consistently demonstrating that specific self-efficacy is a better predictor of task-specific goals and performance behaviors than is general self-efficacy (e.g., Bandura, 1997). As such, because I am interested in boosting training transfer effects, I will focus this research on the construct of *training* self-efficacy.

Training self-efficacy, a type of specific self-efficacy, is defined as an individual's expectation that he or she is capable of learning and succeeding in training (Guthrie & Schwoerer, 1994; Robbins & Judge, 2009). In other words, if individuals are confident that they can successfully learn in training, they are more likely to enter the learning experience with a

positive attitude and high level of preparation (Schwoerer et al., 2005). Moreover, trainees with high self-efficacy have a greater likelihood of putting forth the required effort to attain training-related knowledge and skills and persisting when faced with difficult or challenging tasks (e.g., Blume et al., 2010; Burke & Hutchins, 2007; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Phan, 2011; Velada, Caetano, Michel, Lyons, & Kavanagh, 2007). On the contrary, trainees with low self-efficacy typically have less ambition and lower levels of goal commitment (Bandura, 1997). As such, when learning difficult skills or knowledge during training, low efficacious individuals have a greater chance of being threatened by setbacks and obstacles, reducing their effort, and becoming discouraged with the learning process (e.g., Bandura, 1997; Gist, Schwoerer, & Rosen, 1989; Robbins & Judge, 2009). As the research implies, an individual's training self-efficacy has critical implications for training success, as training programs often target difficult or complex job-related knowledge and skills (Grossman & Salas, 2011). To no surprise, the recent literature continues to demonstrate that training self-efficacy is a strong, positive predictor of training transfer (Blume et al., 2010; Burke & Hutchins, 2007; Gegenfurtner, 2011). As an example, in a recent meta-analysis from Gegenfurtner (2011), training self-efficacy (assessed at the beginning of a training engagement) was positively predictive of transfer ( $r_c = .24$ ).<sup>1</sup>

In particular, existing data support a positive relationship between training self-efficacy and transfer generalization (the ability to apply learning outside of the training environment) and transfer maintenance (continually applying training over time; Ford, Smith, Weissbein, Gully, & Salas, 1998; Gaudine & Saks, 2004; Gist, Stevens, & Bavetta, 1991; Stevens & Gist, 1997; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991). In one study, for example, trainees with

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<sup>1</sup>  $r_c$  = correlation corrected for unreliability

high self-efficacy were more likely to apply what they learned back on the job, especially on those tasks that were more challenging (Ford, Quiñones, Segó, & Sorra, 1992). Additionally, research has consistently found a positive relationship between self-efficacy and learning such that individuals with greater confidence in their abilities to succeed in a learning experience were more likely to acquire new knowledge and skills (Chen, Gully, Whiteman, & Kilcullen, 2000; Ford, Kozlowski, Kraiger, Salas, & Teachout, 1997; Quiñones, 1995). Overall, the evidence is clear: An individual's level of self-efficacy is one of the strongest determinants of trainee outcomes (defined in the current study as both learning and transfer).

In conclusion, there is widespread empirical support that trainees who are confident in their ability to learn new skills and knowledge during training have a higher likelihood of transferring that learning on the job. Thus, one critical trainee readiness variable to assess before a learning experience is training self-efficacy. Accordingly, I propose:

*Hypothesis 1a-1b: Training self-efficacy will positively predict learning (H1a) and training transfer (H1b) in a mobile technology-based training program.*

### ***Learning Goal Orientation***

In addition to training self-efficacy, researchers have also been interested in how one's goal orientation influences training outcomes. Goal orientation reflects an individual's disposition toward engaging in certain behaviors in a learning-specific context (Dweck, 1986). Over the years, research on goal orientation has targeted student achievement in the classroom and athletic performance on the field (e.g., Butler, 1992; Duda & Nicholls, 1992; Dweck & Leggett, 1988), in addition to post-training learning and behavior outcomes (e.g., Bell & Kozlowski, 2002b; Chiaburu & Marinova, 2005; Fisher & Ford, 1998; Ford et al., 1998; Stevens

& Gist, 1997). Generally speaking, the research has focused primarily on two types of goal orientation: performance orientation and learning (or mastery) orientation (Dweck, 1986).

In achievement-focused settings, individuals with a strong performance goal orientation strive to perform at a high level and be perceived as competent on the tasks they are completing. It is common for these individuals to stay away from situations where they might be challenged or have a high chance of failing. On the other hand, individuals who are learning goal-oriented put forth extensive effort to learn as much as possible in an achievement environment. Furthermore, these individuals frequently pursue challenging or difficult tasks, and if they fail or encounter a setback, are more likely to view such experiences as learning opportunities (Button, Mathieu, & Zajac, 1996; Dweck & Leggett, 1988). The goal in the current study is for individuals to learn, apply, and retain new knowledge and skills in a safety training program. As such, I will be solely focused on understanding the role of trainees' *learning* goal orientation.

Grounded in achievement motivation theory, learning goal orientation is an individual difference characteristic that helps us better understand human motivation and behavior in achievement-oriented contexts (Ames & Archer, 1988; Dweck & Leggett, 1988). Specific to training, individuals with a strong learning goal orientation believe that effort and investment in training will have a positive impact on the overall effectiveness of the learning experience. Moreover, learning goal-oriented individuals typically have a strong desire to pursue challenging goals, expand their knowledge and skill base, and identify the most helpful approaches and techniques for learning (e.g., Chiaburu, Van Dam, & Hutchins, 2010; Ford & Weissbein, 1997; Salas et al., 2012).

In the most recent reviews on training transfer, there is compelling evidence that goal orientation matters in training. More specifically, Burke and Hutchins (2007) suggested that

more research is needed on learning goal orientation as a predictor of training effectiveness, Blume and colleagues (2010) provided evidence that learning goal orientation is moderately related to transfer, and Salas et al. (2012) proposed that learning goal orientation is one of the three most critical individual characteristics that influences training outcomes. Moreover, a recent meta-analysis by Gegenfurtner (2011) suggested that learning (or mastery) orientation is positively related to training transfer ( $r_c = .22$ ). Individual empirical studies provide further support of a link between learning goal orientation and training transfer. For example, Phillips and Gully (1997) found that undergraduate students who had a high learning goal orientation experienced stronger learning effects than individuals who were more performance oriented, and Fisher and Ford (1998) demonstrated a positive relationship between learning goal orientation and knowledge gained in training. Additionally, Chiaburu and Marinova (2005) conducted an exploratory study, which supported a positive relationship between learning goal orientation and training outcomes in a sample of employees, while Silver, Dwyer, and Alford (2006) found that learning goal orientation was a strong predictor of transfer among salespeople. Both qualitative and quantitative findings confirm a strong link between an individual's learning goal orientation and training outcomes.

Overall, empirical evidence strongly supports learning goal orientation as a predictor of learning and other training outcomes (e.g., Blume et al., 2010; Salas et al., 2012). As such, I hope to replicate existing findings that trainees' learning goal orientation is positively related to learning and application of that learning on the job.

*Hypothesis 2a-2b: Learning goal orientation will positively predict learning (H2a) and training transfer (H2b) in a mobile technology-based training program.*

### ***Motivation to Learn***

Finally, in addition to training self-efficacy and learning goal orientation, the last trainee readiness characteristic assessed in the current research is motivation to learn. In recent times, trainee motivation has received widespread attention as a key influence on training transfer (Baldwin et al., 2009; Machin, 2002). Organizations have taken an interest in this particular individual difference variable because in order to stay competitive, companies today require a workforce that is willing to put forth effort on the job, capable of performing at a high level, and interested in learning new knowledge and skills. When employees are highly motivated, both individuals and organizations are likely to reap numerous benefits including higher productivity and performance in the workplace (Salas et al., 2012).

Generally speaking, training motivation refers to the level of effort and perseverance that individuals put forth toward achieving learning-oriented goals (Robbins & Judge, 2009; Tannenbaum & Yukl, 1992). With recommendations from Baldwin and Ford (1988) and Noe (1986), researchers have applied expectancy theory (i.e., Valence-Instrumentality-Expectancy (VIE) Theory; Vroom, 1964) to better understand the training motivation – transfer relationship. The expectancy model framework is useful because the VIE composite aligns closely with individual motivation for doing well in training. For example, expectancy reflects an individual's belief that he/she is capable of developing new skills, instrumentality refers to an individual's perception that gaining new skills will result in certain job-related outcomes, and valence reflects one's desire for successful performance (see Mathieu & Martineau, 1997, for a more detailed explanation). By applying VIE theory, training transfer is grounded in a motivational framework.

Within the training literature, a variety of motivation-related constructs have been explored including an individual's motivation to transfer and motivation to learn. While

motivation to transfer reflects the anticipated energy and effort a trainee will put forth to apply what was learned in training on the job (Noe, 1986), motivation to learn reflects a trainee's interest in and desire for learning new job-related knowledge and skills (Noe, 1986; Noe & Schmitt, 1986). Both of these constructs have demonstrated strong relationships with training transfer (Burke & Hutchins, 2007) but the current study will solely focus on *motivation to learn* as a readiness characteristic that influences training success from the very beginning of a learning engagement. Existing research highlights that in order for transfer to occur, motivation to learn must be high. In other words, trainees must be confident that: they are capable of learning new skills (expectancy), effort put forth toward learning will result in improved performance (instrumentality), and enhanced performance outcomes will lead to other desirable and positive results (valence; e.g., Fecteau et al., 1995; Grossman & Salas, 2011).

As demonstrated in three recent meta-analyses by Colquitt et al. (2000), Blume et al. (2010), and Gegenfurtner (2011), there is support for assessing motivation to learn within the context of training. Colquitt and colleagues (2000) provided evidence that motivation to learn was significantly related to declarative knowledge ( $r_c = .27$ ) and skill acquisition ( $r_c = .16$ ), Blume and colleagues (2010) demonstrated that trainee motivation was positively linked to training transfer ( $r_c = .23$ ), and Gegenfurtner (2011) found that motivation to learn was significantly predictive of transfer on the job ( $r_c = .24$ ). A considerable number of single studies further highlight how motivation to learn predicts trainee outcomes. To elaborate, research findings have shown that motivation to learn positively affects individuals' participation in training (e.g., Noe & Wilk, 1993; Tharenou, 2001), learning outcomes (e.g., Baldwin, Magjuka, & Loher, 1991; Mathieu, Tannenbaum, & Salas, 1992; Sitzmann, Brown, Ely, & Kraiger, 2009; Tracey, Hinkin, Tannenbaum, & Mathieu, 2001), and the application of training knowledge and

skills in the workplace (e.g., Facticeau et al., 1995; Quiñones, 1995; Tziner, Fisher, Senior, & Weisberg, 2007). Taken as a whole, this evidence provides clear support for the importance of motivation to learn within the training transfer process.

To summarize, a final trainee readiness characteristic that is critical to assess pre-training is an individual's motivation to learn. As suggested in existing meta-analyses, literature reviews, and empirical research studies, I propose that motivation to learn will positively predict learning and transfer post-training.

*Hypothesis 3a-3b: Motivation to learn will positively predict learning (H3a) and training transfer (H3b) in a mobile technology-based training program.*

Over the years, both empirical and conceptual transfer models have highlighted the influence of individual differences on training outcomes (e.g., Alvarez et al., 2004; Cannon-Bowers et al., 1995; Foxon, 1993; Machin, 2002; Milheim, 1994; Noe, 1986). In particular, researchers have been interested in deeply understanding the core components of 'trainee readiness', or the unique attitudes, motivations, and expectations that an individual brings to training, which can either foster or hinder training success (e.g., Baldwin et al., 2009; Tannenbaum et al., 1993). Thus, to continue building our knowledge base of critical trainee readiness factors (but expanding this research to a mobile technology-based training program), I explore three characteristics (training self-efficacy, learning goal orientation, and motivation to learn) that have demonstrated strong, consistent relationships with transfer. Next, I will explore how the work environment contributes to training transfer success.

### **The Work Environment.**

Dating back to the 1950's, Fleishman, Harris, and Burt (1955) were the first to put forth the hypothesis that a supportive work environment can influence outcomes of training. Findings

from their research suggested that managers who went through a training program experienced positive benefits immediately post-training, but these effects diminished over time. To better understand why this happened, Fleishman and colleagues interviewed several training participants, and afterwards, concluded that a lack of supervisor support contributed greatly to the transfer failure. As a result of this initial research, individuals became curious about the different work environment/ organizational climate factors that influence the training transfer process (Rouiller & Goldstein, 1993). Beginning in the 1970's, Baumgartel and colleagues provided early support for a positive relationship between organizational climate and training transfer (Baumgartel & Jeanpierre, 1972; Baumgartel, Reynolds, & Pathan, 1984; Baumgartel, Sullivan, & Dunn, 1978). By the late 1980's, Goldstein (1986) advocated that a supportive organizational climate was critical for training to be maximally effective. In other words, Goldstein believed that a training investment was ineffective if an organization did not fully support trainees' use of their newly acquired learning in the work environment. Since these initial findings, researchers have continually demonstrated that work environment characteristics matter, playing a critical role in either speeding up training transfer or interfering with the 'stickiness' of training over time (e.g., Baldwin et al., 2009; Grossman & Salas, 2011; Kozlowski & Salas, 1997; Kraiger, 2003; Salas et al., 2012). As such, multiple training transfer models have incorporated contextual elements into their frameworks of training effectiveness (e.g., Alvarez et al., 2004; Cannon-Bowers et al., 1995; Foxon, 1993; Machin, 2002; Milheim, 1994; Noe, 1986).

As an example, Machin (2002) proposed that at the conclusion of a training event, the transfer climate plays a critical role in whether or not individuals effectively transfer their training knowledge and skills in the workplace. As defined by Cromwell and Kolb (2004), the transfer climate refers to “work-environment factors perceived by trainees to encourage or

discourage their use of knowledge, skills, and abilities learned in training on the job” (p. 451). With evidence that work environment characteristics explain a considerable amount of variance in training outcomes (see Ford & Weissbein, 1997; Burke & Hutchins, 2007; Baldwin et al., 2009; Blume et al., 2010; and Grossman & Salas, 2011, for more detailed reviews), my study aims to contribute to the literature by providing additional empirical support for the post-training – transfer links proposed in Machin’s (2002) transfer framework.

As suggested by Baldwin and Ford (1988), there are multiple ways to foster a positive work environment including: (1) Removing any potential barriers or situational constraints that may interfere with transfer, (2) providing individuals with opportunities (at work) to practice what they learned in training, and (3) supporting trainees to use their new knowledge and skills on the job. To elaborate, Peters, O’Conner, and Eulberg (1985) identified 11 basic categories of organizational constraints (e.g., tools and equipment, budgetary support, scheduling of activities), and Rouiller and Goldstein (1993) proposed several situational cues (e.g., social cues) and consequences (e.g., positive feedback) that affect transfer outcomes. As demonstrated in this research from Peters et al. (1985) and Rouiller and Goldstein (1993), situational constraints can be barriers to training transfer success. Moreover, additional research has targeted employees’ opportunities to perform trained tasks in the work environment. As one example, findings from Ford et al. (1992) demonstrated that having the opportunity to perform trained tasks at work was positively related to training transfer.

Although many studies have focused on situational constraints and the opportunity to perform trained tasks (two key work environment variables), there is an abundance of data suggesting that *supervisor support* is one of the most influential work environment characteristics within the context of training transfer (e.g., Baldwin & Ford, 1988; Chiaburu et

al., 2010; Cromwell & Kolb, 2004; Kraiger, McLinden, & Casper, 2004). Consequently, the current research focuses specifically on the role of supervisor support as an accelerator of training success. Below I discuss research around the construct of supervisor support and its critical role in the training process.

### ***Supervisor Support***

According to organizational support theory, “employees develop global beliefs concerning the extent to which the organization values their contributions and cares about their well-being” (Eisenberger, Huntington, Hutchison, & Sowa, 1986, p. 501). These beliefs are referred to as perceived organizational support (POS), suggesting that employees are more likely to feel committed to an organization and exert effort toward work-related objectives when they anticipate some kind of reward for their efforts (e.g., feeling valued and supported by their organization). Additional theory purports that employees also have insights and opinions about the extent to which they feel valued and supported by their *supervisors* (Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002; Kottke & Sharafinski, 1988). These beliefs are referred to as perceived supervisor support (PSS). Specifically within the training literature, numerous definitions have been utilized to describe perceptions of supervisor support, and most fall into the following categories: supervisor support *for training* or supervisor support *for transfer*.

Supervisor support for training is typically assessed pre-training and may include actions like supporting individual engagement in training and development opportunities (Noe & Wilk, 1993), setting learning expectations before a training experience (Brinkerhoff & Montesino, 1995), and providing assistance to trainees so they can attend a training program (Gregoire, Propp, & Poertner, 1998). On the other hand, supervisor support for transfer is typically assessed

post-training and may include such actions as supporting trainees to apply trained knowledge and skills in the workplace (Facteau et al., 1995), providing individuals with opportunities to perform new knowledge and skills at work (Chiaburu & Tekleab, 2005), and reinforcing the use of training-relevant learning in the workplace (Bates, Holton, & Seyler, 1996). As discussed by Tannenbaum and Yukl (1992, p. 420), “elements of the posttraining environment can encourage (e.g., rewards, job aids), discourage (e.g., ridicule from peers), or actually prohibit the application of new skills and knowledge on the job (e.g., lack of necessary equipment)”. In the current study, I focus specifically on *supervisor support for transfer* since I am most interested in post-training work environment factors that help sustain transfer over time.

There is both qualitative and quantitative evidence that supervisor support is a salient work environment factor related to training transfer (e.g., Brinkerhoff & Montesino, 1995; Broad & Newstrom, 1992; Chiaburu et al., 2010; Colquitt et al., 2000; Cromwell & Kolb, 2004; Gregoire et al., 1998; Saks & Belcourt, 2006; Tracey et al., 1995). Furthermore, beyond trainee application of knowledge and skills on the job, supervisor support has been linked to perceptions of training utility (Guthrie & Schwoerer, 1994), motivation to transfer (Foxon, 1997), and the amount of opportunities trainees are given to apply their learning in the workplace (Ford et al., 1992). Yet, at the same time, there are also studies in which supervisor support and transfer are not related (e.g., Awoniyi, Griego, & Morgan, 2002; Axtell et al., 1997; Cheng & Ho, 2001; Facteau et al., 1995; Seyler, Holton, Bates, Burnett, & Carvalho, 1998; van der Klink et al., 2001). For example, in a sample of government workers, Facteau et al. (1995) found no relationship between supervisor support and skill transfer, and Awoniyi et al. (2002) found no link between supervisory encouragement and training transfer among almost 300 individuals who had taken a professional training course.

To better understand these mixed findings and the true relationship between supervisor support and transfer, there is a need for research to identify the types of supportive actions that are most critical (e.g., Baldwin & Ford, 1988; Cromwell & Kolb, 2004; Foxon, 1997; Quiñones et al., 1995; Smith-Jentsch, Salas, & Brannick, 2001) and the specific role of supportive supervisors in successful training outcomes (Kraiger, 2003). Consequently, one of my goals is to provide some much-needed clarity on the types of supervisory behaviors that are most helpful in the training transfer context.

Overall, there is general agreement that supervisor support is best conceptualized as a multi-dimensional construct (e.g., Baldwin & Ford, 1988), consisting of numerous supervisory practices that provide trainees with the support they need to effectively transfer training-related learning on the job. For example, there is evidence that actions like role modeling trained behaviors (e.g., Decker, 1980), giving trainees opportunities to practice trained behaviors (e.g., Ford et al., 1992), engaging trainees in coaching discussions (e.g., Brinkerhoff & Montesino, 1995), and giving trainees reminders to use their training skills (e.g., Chiaburu & Tekleab, 2005), are important in the transfer process. Additionally, qualitative research from Foxon (1997) identified six key supportive supervisory actions including spending time with trainees, offering trainees' feedback, observing trainees applying their learning on the job, role modeling key training behaviors, providing practice opportunities on the job, and offering advice on effective skill use. Grossman and Salas (2011) also proposed that supervisors are capable of supporting trainees in a variety of ways at different points in time. For example, there is a relationship between goal setting and transfer such that supervisor communication about goals prior to training (e.g., Burke & Hutchins, 2007) and supervisor assistance in setting post-training goals (e.g., Taylor, Russ-Eft, & Chan, 2005), are two strategies for fostering positive training transfer.

Finally, research demonstrates the importance of recognizing, encouraging, and rewarding trainees for use of training-related knowledge and skills at work (e.g., Rouiller & Goldstein, 1993; Salas & Stagl, 2009; Salas et al., 2006; Tracey et al., 1995).

While several researchers have made attempts to identify the specific supervisory actions that are most important (as discussed above), there is still a lack of consensus regarding which behaviors to measure, resulting in a need to improve our operationalization of the supervisor support construct. As such, I propose using transformational leadership theory to guide the identification of key supervisory support actions in the transfer process.

### ***Safety Transformational Leadership***

To begin, I will discuss transformational leadership theory. In the past several decades, transformational leadership has received extensive empirical support (Avolio, 1999; Bass, 1998); transformational leadership refers to “leader behaviors that transform and inspire followers to perform beyond expectations while transcending self-interest for the good of the organization” (Avolio, Walumbwa, & Weber, 2009; p. 423). Transformational leadership theory (Bass, 1985) proposes that highly effective leaders engage in four key types of behaviors: idealized influence (i.e., role modeling ethical behaviors which garners employee trust and respect), intellectual stimulation (i.e., encouraging creativity and fostering employee learning), inspiration motivation (i.e., communicating a positive vision for the future that encourages others to take action), and individualized consideration (i.e., listening and supporting others’ needs with a goal of fostering individual development). In general, transformational leadership is a supportive leadership style that has been linked to critical workplace outcomes including organizational commitment (e.g., Barling, Weber, & Kelloway, 1996), satisfaction with leadership (e.g., Hater & Bass, 1988), and

increased performance of individuals (e.g., Howell & Avolio, 1993; Howell & Hall-Merenda, 1999) and organizations (e.g., Geyer & Steyrer, 1998; Howell & Avolio, 1993).

Given the focus of this study on a safety training program, it is important to understand transformational leadership behaviors within the domain of safety. To elaborate, Schneider and colleagues (e.g., Schneider, Bowen, Ehrhart, & Holcombe, 2000; Schneider & Reichers, 1983) argued that the climate construct is meaningless unless it is associated with a specific referent (e.g., climate for innovation, climate for service, climate for safety, etc.), providing evidence that “micro-climates” are more potent determinants of behavior than general climate dimensions. In the current study, I am primarily interested in work environments that support a safety training program. As such, I am choosing to examine the potency of transformational leadership behaviors by looking specifically at *safety* transformational leadership.

The first empirical research to study transformational leadership specific to safety was conducted by Barling et al. (2002). With evidence that leaders influence employee attitudes and behaviors related to safety in the workplace (e.g., Hoffman & Morgeson, 1999; Zohar, 2002), Barling et al. (2002) developed a safety-specific transformational leadership scale.<sup>2</sup> The authors highlighted how each element of transformational leadership was pertinent to promoting workplace safety. More specifically, in terms of *idealized influence*, Barling et al. proposed that safety transformational leaders serve as role models who hold safety as a core value, thus fostering greater employee commitment to safety on the job. Next, Barling et al. suggested that safety transformational leaders *intellectually stimulate* others, through challenging and motivating employees to think differently about safety in the workplace. Further, Barling et al.

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<sup>2</sup> Research from Mullen and Kelloway (2006; as cited in Mullen & Kelloway, 2009) demonstrated that safety transformational leadership behaviors explain incremental variance in safety-related outcomes, beyond general transformational leadership behaviors.

proposed that safety transformational leaders display *inspirational motivation* behaviors by communicating a positive vision for the future, highlighting that employees are capable of achieving high levels of safety performance. Lastly, in terms of *individualized consideration*, Barling et al. suggested that safety transformational leaders are very supportive and concerned about the health, well-being, and safety of their employees. Thus, a safety transformational leader is an organizational agent who engages in transformational leadership behaviors, but with the purpose of promoting positive work-related safety attitudes and actions (Mullen & Kelloway, 2009).

While the study of safety transformational leadership is still in its infancy, extant research has explored the following outcomes of this psychological construct: Occupational injuries (Barling et al., 2002; Kelloway et al., 2006), safety-related events (Mullen & Kelloway, 2009), and leader and employee safety-related outcomes like safety attitudes, intentions to promote safety, and leader self-efficacy (Mullen & Kelloway, 2009). As of late, no research has explored the influence of safety transformational leadership behaviors on training effectiveness outcomes such as learning and transfer. As purported by Kelloway et al. (2006), in order to foster positive safety-related outcomes at work, it is essential for organizational leaders to support and champion workplace safety. Thus, I aim to examine whether perceptions of supervisors' safety transformational leadership behaviors support employees in the transfer of safety-related training.

In this study, I operationalize supervisor support for transfer in terms of safety transformational leadership behaviors for several reasons. First, the goal of the training program assessed in this study was to promote helpful safety attitudes and behaviors in high-risk organizations. Likewise, safety transformational leaders strive to foster positive safety-related

outcomes in the workplace. With a desire to achieve identical goals, I believe that engaging in safety transformational leadership behaviors is one mechanism to foster support for training transfer in the current research. Second, compared to other theories of leadership, transformational leadership theory has received extensive empirical attention over the last several decades (Avolio, 2005; Lowe & Gardner, 2000). Moreover, this well-supported leadership theory has identified four key behaviors (i.e., idealized influence, inspiration motivation, intellectual stimulation, individualized consideration) that predict individual and organizational performance (e.g., Avolio et al., 2009). While a few researchers have attempted to identify specific leader behaviors that matter before, during and after training (e.g., Brinkerhoff & Montesino, 1995; Chiaburu & Tekleab, 2005; Ford et al., 1992; Foxon, 1997), there is a need to incorporate a more theoretical approach to understand which supervisory behaviors matter most. Grounded in a validated framework, safety transformational leadership can provide some theoretical and practical insights about what it means to be ‘supportive’ within a safety training context. Third, safety transformational leadership is a relatively new construct with limited empirical investigation, thus offering great potential for research. For instance, assessing this construct within the context of organizational training has enormous practical value for high-risk organizations. In other words, if there is positive support for a relationship between safety transformational leadership behaviors and key training outcomes, I will be able to provide organizational leaders with actionable strategies that help boost training success and ultimately enhance safety results. Taken all together, I propose using transformational leadership theory to guide the identification of key supervisory support actions. In the following section, I will discuss how the relationship between supervisor support and training transfer is likely moderated by trainee readiness variables.

### *Interactions between Trainee Readiness and Supervisor Support*

As discussed thus far, there are numerous forces outside of a training program that can affect training success before, during, or after a learning experience (e.g., Colquitt et al., 2000; Foxon, 1997). Consequently, there has been a growing interest to more deeply comprehend the various characteristics that influence training outcomes (e.g., Baldwin & Ford, 1988; Baldwin et al., 2009; Quiñones, 1997; Salas & Cannon-Bowers, 2001). One particular area that has received strong research attention is the extent to which trainee and work environment factors interact to predict training transfer in the workplace (e.g., Ford & Weissbein, 1997; Kozlowski & Salas, 1997). In other words, while traditional training approaches have focused on the independent effects of different variables on training outcomes, the training transfer process may be best understood as an interaction of diverse aspects of the trainees themselves and the environments in which they work.

One of the foundational research studies to explore this interaction argument comes from Quiñones et al. (1995) who examined both individual differences (i.e., career motivation, locus of control, learning) and work environment variables (i.e., workgroup support, supervisor attitudes) as antecedents of transfer. The authors tested two different models to explain the relationships among these constructs, including a direct effects model (where individual and work environment characteristics independently predicted transfer) and a mediated effects model (where individual difference factors indirectly affected transfer through an impact on environmental factors). Results demonstrated support for an interaction between trainee and work environment characteristics in relation to transfer (i.e., the mediated effects model). By taking an interactionist perspective, Quiñones et al. supported the idea that “characteristics of the people and of situations jointly determine individual attitudes, cognitions, and behavior” (Ford &

Weissbein, 1997; p. 37). This phenomenon, also described as a social interactionist hypothesis (e.g., Smith-Crowe, Burke, & Landis, 2003), reflects the perspective that a relationship between two factors is often influenced by a third factor.

Additional research evidence further suggests there are complex interactions between people and environmental characteristics in the context of training. For example, because there are many uncertainties associated with participation in “training”, trainees’ personal characteristics may influence their interpretation of different aspects of their environment (e.g., perceptions of support, opportunities to practice). Thus, depending on an individual’s innate qualities, he or she may be more or less likely to succeed in training (as demonstrated by the long-term application of training knowledge and skills on the job; Smith-Jentsch et al., 2001). Moreover, a 2004 study by Pidd demonstrated that the relationship between social support and training transfer was moderated by workplace identification (an individual difference variable). Thus, success in a learning environment has been linked to a combination of the characteristics trainees’ bring with them to training, as well as the supportiveness of the organizational context in which they work. Both training designers and training researchers need to consider the potential interaction of these factors and how they jointly impact trainee outcomes.

As previously discussed, there is mixed evidence regarding the association between supervisor support and transfer, with some studies finding a strong positive relationship (e.g., Brinkerhoff & Montesino, 1995; Broad & Newstrom, 1992; Cromwell & Kolb, 2004; Tracey et al., 1995), and others finding a weak (or no) relationship (e.g., Axtell et al., 1997; Fecteau et al., 1995; van der Klink et al., 2001). With these mixed findings, it becomes important to understand potential moderating variables that influence whether individuals receive short-term and/or long-term benefits from training (e.g., see Kirkman, Rosen, Tesluk, & Gibson, 2006 for a similar

argument in the context of team training). Furthermore, it is particularly important for individuals to transfer safety-related training knowledge and skills since such training is often targeted at minimizing risks and preventing injuries on the job (Smith-Crowe et al., 2003). As such, a deeper assessment of potential moderating variables in the context of safety training has huge implications for both individuals and their organizations. The value of taking an interactionist perspective is best summed up by Mathieu and Martineau (1997, p. 216) who stated: “In summary, the training system must be viewed in the context of ongoing organizational processes, and the effectiveness of training depends on the program as well as relevant individual and situational factors.”

In summary, I suggest that the relationship between supervisor support and transfer is likely influenced by a third variable: trainee characteristics. Consequently, I argue that the most important trainee characteristics to assess relate to readiness for training, defined in this study as training self-efficacy, learning goal orientation, and motivation to learn. Thus, trainee readiness factors are proposed to serve as moderators, such that supervisor support and transfer likely have a stronger relationship when trainee readiness for training is high than when trainee readiness is low. By exploring trainee readiness as a moderator variable, I contribute to the discussion of boundary conditions of the supervisor support – transfer relationship. I hypothesize the following relationships:

*Hypothesis 4: The relationship between safety transformational leadership and trainee outcomes (learning, transfer) is stronger for those who are high in training self-efficacy than those who are low in training self-efficacy.*

*Hypothesis 5: The relationship between safety transformational leadership and trainee outcomes (learning, transfer) is stronger for those who are high in learning goal orientation than those who are low in learning goal orientation.*

*Hypothesis 6: The relationship between safety transformational leadership and trainee outcomes (learning, transfer) is stronger for those who are high in motivation to learn than those who are low in motivation to learn.*

### **Practice.**

Finally, beyond the exploration of trainee readiness and supervisor support as accelerants of training transfer, another key construct in the training and development literature is practice. Although there is extensive anecdotal evidence that practice matters in the learning process (e.g., the old adage, “practice makes perfect”), there is limited research empirically supporting the role of practice in the transfer of complex organizational skills. Practice has been explained in a variety of ways but for the purpose of the current study, I will utilize a definition from Cannon-Bowers, Rhodenizer, Salas, and Bowers (1998; p.292) who define practice as: “the physical or mental rehearsal of a task (or skill or knowledge) undertaken with the implicit or explicit goal of achieving some level of proficiency in performing that task (or skill, or demonstrating that knowledge).”

Dating back to the seminal research on training transfer, Baldwin and Ford (1988) discussed how various aspects of training design influence the effectiveness of training. One particular factor, conditions of practice, was included in Baldwin and Ford’s model to reflect a variety of issues associated with the design of training including how often and how long trainees continued to practice their learning over time. Thus, Baldwin and Ford provide conceptual support for the role of practice in training success. Additionally, Machin (2002) also

highlighted the role of practice in the training transfer process. Specifically, Machin discussed how engaging in key actions during training could help improve learning and expertise post-training. For example, Machin proposed that transfer is likely strengthened when supervisors support trainees in practicing their new skills on the job. Thus, theoretical work on training transfer (e.g., Baldwin & Ford, 1988; Machin, 2002) supports practice as a key influence on training transfer.

Further evidence suggests that in order for training to successfully transfer, trainees need both the resources (e.g., support, time, cues) and available opportunities to practice performing their newly acquired skills (e.g., Burke & Hutchins, 2007; Clarke, 2002; Cromwell & Kolb, 2004; Gilpin-Jackson & Bushe, 2007; Lim & Johnson, 2002; Rouiller & Goldstein, 1993; Salas et al., 2006; Weissbein, Huang, Ford, & Schmidt, 2011). Likewise, research has consistently demonstrated a positive relationship between skill decay (i.e., transfer failure) and a lack of opportunity to practice newly developed skills (e.g., Clarke, 2002; Ford et al., 1992; Lim & Johnson, 2002; Noe, 1986; Peters & O'Connor, 1980; Salas et al., 2006). In fact, a meta-analysis from Arthur et al. (1998) revealed that failing to practice knowledge or skills post-training was associated with substantial skill loss. Taken together, it is clear that practice matters in order for individuals to actually apply training-related knowledge and skills at work.

However, there are still many problems with the empirical study of practice in the training literature. To elaborate, there is little clarity regarding how and when to practice new skills on the job (Holladay & Quiñones, 2003; May & Kahnweiler, 2000; Schmidt & Bjork, 1992), initial conceptualizations of practice have been derived from laboratory research on simple skills that may not translate to organizational settings (Arthur et al., 1998; Schneider, 1985), and there is a need to better understand practice in terms of the acquisition of complex

cognitive and interpersonal skills (Kanfer, 1992; May & Kahnweiler, 2000). As such, there has been a call to more deeply examine how practice relates to complex, real-world skill development.

One recent study to investigate the topic of practice in a training context was conducted by Weissbein et al. (2011). These researchers asked participants to self-report whether they had practiced any training-relevant activities after their initial learning experience. Example questions answered by trainees included “thought specifically about how to achieve [my] goals” and “reviewed training materials and notes”. Results revealed that engaging in practice post-training mediated the relationship between trainee individual difference factors (i.e., motivation to learn) and training transfer performance. Thus, this research study supported the role of practice as a mediator variable in the transfer process, and highlighted the importance of investigating individual differences in the practice – transfer relationship.

Overall, there is an implicit assumption that practice influences training outcomes, and recent empirical studies are beginning to support this claim within the context of complex skill training (e.g., Weissbein et al., 2011). However, at the same time, there is no real consensus on the best approach for operationalizing the construct of practice. Consequently, I will draw upon Kraiger’s (2002) training evaluation framework, which describes successful skill acquisition in terms of proceduralization and compilation. While proceduralization refers to the replication of skills obtained during training, compilation refers to trained skills becoming automatic and second-nature over time. Thus, individuals who have successfully transferred training skills are likely to experience both proceduralization and compilation. Building upon research from Weissbein et al. (2011) and theory from Kraiger (2002), I wonder if practice is a mechanism by which proceduralization and compilation occur. More specifically, I am interested in empirically

investigating practice as a mediator in a field study targeting complex, safety-related skill training. Since there is little research to draw on, the study of practice is proposed as a set of research questions rather than hypotheses:

*Research Question 1a-1c: Does practice mediate the relationship between (RQ1a) training self-efficacy and transfer, (RQ1b) learning goal orientation and transfer, and (RQ1c) motivation to learn and transfer?*

Thus far, I have put forth several research hypotheses and questions related to boosting training success. The final discussion point that is important to address is the context of the current study.

### **A Mobile Technology-Based Training Program**

A new trend in organizational training is technology-delivered instruction (TDI; e.g., Aguinis & Kraiger, 2009; Green & McGill, 2011; Patel, 2010), which consists of learning knowledge and skills related to the job through technology (e.g., computer software programs, web-based applications, etc.; Aguinis et al., 2009; Kraiger & Culbertson, 2012). This type of training is often self-paced, asynchronous, and interactive, such that learners interact with the technology and receive immediate feedback (Bedwell & Salas, 2010). Overall, there are multiple advantages associated with TDI programs. These include potential cost savings (due to the elimination of training facilitators, rooms for training sessions and associated travel expenses), as well as enhanced flexibility regarding when (time of day, day of week) and where (at home, in the office, on the road) individuals complete their training (Kraiger & Culbertson, 2012).

Although flexibility is one important benefit of TDI, it is also a potential disadvantage. When individuals have a high amount of learner control, trainees become more responsible for determining when and how to learn job-related knowledge and skills (Noe, 2008). As

demonstrated by Kraiger and Jerden (2007), high learner control can have a detrimental impact on learning outcomes (e.g., too much control can lead to poor decision making; DeRouin, Fritzsche, & Salas, 2004). Consequently, it becomes important to provide learners with additional support and guidance to help trainees navigate this type of learning experience (i.e., adaptive guidance; Bell & Kozlowski, 2002a).

Keeping these benefits and challenges of TDI in mind, researchers have struggled to clearly identify which training approach is most effective, training that leverages technology, or face-to-face programming (see meta-analyses by Sitzmann, Kraiger, Stewart, & Wisher (2006) and Zhao, Lei, Lai, & Tan (2005) for empirical findings on this topic). Although we may never have a solid answer about which training approach is optimal for enhancing individual and organizational success (Kraiger, 2003), there continue to be innovations in the technology available for organizational learning and development. Most recently, TDI is becoming more advanced and more mobile, through the use of smartphones and tablet computers as learning tools (e.g., Bonk, Kim, & Zeng, 2005; Cornelius & Marston, 2009; de-Marcos et al., 2010). This new mobile learning approach, or m-learning, utilizes small personal devices to deliver content, making the learning process convenient (easy to access, immediate) and ubiquitous (available anytime, anywhere; e.g., Abernathy, 2001; Peng et al., 2009; Sharples, 2000).

Highly effective m-learning approaches share some common characteristics (and advantages) including social interactivity (support collaboration, active engagement by participants, and real-time feedback), personalization (training is customized and relevant to learner's needs), portability (training is available whenever the learner is ready), and economic viability (often cheaper than other e-learning platforms; Tucker, 2010). Although the value of mobile technology for learning and development is just starting to be realized, preliminary

findings suggest that these types of learning tools can help increase exam scores after training (Brown, 2010) and improve student achievement (de-Marcos et al., 2010). In contrast to more traditional training (like face-to-face programs), mobile learning appears to be an attractive approach to development that activates interest and engagement throughout the learning process (Hwang & Chang, 2011). With a similar sentiment, Low and O'Connell (2006) proposed that, "the highly personalized nature of digital mobile devices provides an excellent platform for the development of personalized, learner-centric educational experiences" (p. 2, cited in Looi et al., 2009).

On the other hand, there are some potential disadvantages to mobile learning approaches as well. For example, researchers have suggested that training conducted via mobile learning devices might lead to information overload (Motiwalla, 2007), challenge trainee engagement in the learning material (Cornelius & Marston, 2009), over-simplify the learning content (McAndrew, Taylor, & Clow, 2010), or take a while to be fully adopted (Cochrane, 2010). Further, it is important to ensure that an organizational investment in mobile learning tools makes sense, given that certain media may become obsolete as newer technology is continually being developed and distributed (Looi, Seow, Zhang, So, Chen, & Wong, 2010). Despite these challenges, organizations are increasingly recognizing the benefits of m-learning approaches, with more and more companies adopting personal devices for learning on the job (e.g., Sharples, Arnedillo- Sánchez, Milrad, & Vavoula, 2009). As such, additional research is needed to better understand the impact of this technology movement on training success.

While research on m-learning in the workplace is still in its infancy, we do know that regardless of the medium, it is critical for training to be well-designed and founded on key learning principles (Bedwell & Salas, 2010; Clark, 1994; Kraiger & Culbertson, 2012). To

maximize the likelihood of transfer, the innovative mobile technology-based training program that is assessed in this study incorporates a variety of instructional design principles. The following elements will be discussed in more detail below: realistic training environment, spaced practice, and active learning.

One strategy for accelerating transfer is creating a training environment that is similar to the trainees' work environment. With a high-fidelity training program, where the learning context resembles the job context, there is a greater probability that knowledge and skills from training will transfer because trainees have essentially had the opportunity to "practice" applying their learning, in a realistic setting (Burke & Hutchins, 2007; Grossman & Salas, 2011; Kraiger, 2003; Salas et al., 2006). In the mobile technology-based program assessed in this study, training happens on-the-job, in the actual environment where the skills being learned will be applied. With the acquisition and transfer context being one in the same, there is a greater likelihood for transfer to take place.

In addition to having a realistic training environment, it is also critical to be intentional about how the training content is delivered (e.g., will training be delivered in one session or divided into multiple sessions over time?). Researchers have been interested in this idea of massed practice (learning a lot of information in a short period of time) compared to spaced or distributed practice (spreading out learning over time) for many years and the findings are pretty consistent: When information is learned over a longer period of time (i.e., across multiple training sessions), individuals experience greater knowledge retention and enhanced learning benefits (e.g., Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006; Schmidt & Bjork, 1992). Although many organizational training programs follow the "information overload" approach, trying to cram as much information into a single training session as possible (Machin, 2002), there is real

value (as evidence suggests) to distribute learning across multiple days. As such, the training program in the current study takes a micro-training approach where the learning content is delivered across 31 “mini modules” (which are no longer than 15 minutes) over the course of 31 days. Spacing the training content over time is likely to help boost transfer effects.

Finally, the training program in the current study is designed to foster active learning. According to Bell and Kozlowski (2008), there are several keys to active learning which include: (1) Learners taking responsibility for their own learning and development, and (2) learners actively experimenting, seeking feedback, and engaging in self-reflection. The current training program fosters active learner engagement by giving learners control over when during the day they can complete training, and through prompting discussion among trainees, embedding interactive games with immediate feedback, and giving learners opportunities to self-reflect. Furthermore, compared to passive learning approaches like videos and lectures (Kraiger & Culbertson, 2012), active learning approaches help encourage adaptive transfer that “involves using one’s existing knowledge base to change a learned procedure, or to generate a solution to a completely new problem” (Ivancic & Hesketh, 2000, p. 1968). Adaptive transfer is especially critical in the current training program, which teaches employees complex knowledge and skills related to safety (which matters because high risk safety situations are never the same). As such, through promoting active learning, the training program in this study enhances the likelihood of training transfer success.

In summary, the current research assesses the effectiveness of an innovative training platform that leverages key learning principles and best practices in training design. This study explores how various individual and work environment characteristics contribute to the transfer process, helping to enhance both the science and practice of training transfer.

## METHOD

### Participants

Participants in the current study are frontline workers from two organizations (one in the mining industry and another in the manufacturing industry) in the United States and Canada who took part in a 10-module, safety training program delivered via tablet computers. While the mining organization provides commercial explosives and other advanced blasting solutions, the manufacturing organization provides electrical, mechanical, and hydraulic power solutions. Employees from these companies work in two industries where hazards are prevalent and safety-related accidents and injuries are likely (i.e., mining, manufacturing), thus highlighting the need for training and development around safety. Participating organizations contracted with a third-party consulting firm who designed, delivered, and supported the implementation of this training program. All front-line employees were eligible for training, and organizational leadership played a key role in scheduling participation in this program. With a limited number of training devices (i.e., tablet computers), a rolling group design was utilized so that eventually, all qualified employees would partake in this learning experience (at varied points in time). As such, participants in my study were any individuals who had completed this training program as of June 2013.

An a priori power analysis suggested that approximately 100 individuals were needed to have enough statistical power to test my hypotheses. In total, complete data (defined as individuals who finished both the pre-survey during module 1 and post-survey during module 10) were collected from 201 individuals. Thus, the 201 individuals who participated in the current study were judged as adequate to test the hypothesized effects. In terms of sample

demographics, these individuals worked in two different organizations on 34 worksites throughout the United States and Canada.<sup>3</sup> Due to client confidentiality requests, specific demographic information for study participants was not available. However, it is known that most employees in these two participating organizations were White men.

## **Procedure**

The training program assessed in this research was designed based on learning principles from management and psychology, with the goal of helping individuals better understand how the ways in which they think and make decisions influences their safety-related behaviors in the workplace. Each module in this program covered unique safety principles including topics like creating a positive safety culture, the brain-body connection, complacency in high-risk work, and stress management. These learning modules (ten in total) were broken down into small training segments that were delivered across three days. For example, during module six, participants learned about “complacency in high-risk work”, and different learning concepts related to complacency were presented and discussed in separate training sessions over the course of three days. While most of the learning modules were three days long (modules 1-9), module 10 (which focused on integrating and applying concepts learned in the previous nine modules) was four days long. This fourth day gave participants additional time to apply and practice training-relevant knowledge and skills. In total, participants completed 31 days of training totaling

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<sup>3</sup> While employees in the manufacturing organization worked on one site together (i.e., in a plant environment), individuals working for the mining organization were based on 33 worksites around North America. Moreover, the number of training participants per site varied drastically, ranging from 1 to 52 individuals with an average of 5.9 employees ( $SD = 8.9$ ) participating in training from each site. Given the uneven distribution of sites per organization and participants per site, it was inappropriate to test my hypotheses at the site level using hierarchical linear modeling. Thus, data analyses in this study only took into account the *organization* in which an employee was based (i.e., I controlled for employee organization in all hierarchical regression analyses).

approximately 450 minutes of time over the course of ten weeks (one module was completed each week).

Based on a microtraining approach, learners participated in small segments of training (10-15 minutes) at a time. In other words, the training was set up so that each day of learning was at most 15 minutes long, allowing individuals to go through the training in their own work environments so as not to disrupt the regular work day and/or production. Moreover, in order to accommodate varying work schedules and job responsibilities, participants completed the training either on their own (if they worked in a remote location) or in groups of two to three individuals. The maximum group size was three individuals in order for participants to actually see the tablet screen and maintain engagement in the training material.

Data for the current research study were collected during a pre-survey in the beginning of training (during module 1; i.e., trainee readiness factors) and a post-survey at the end of the program (during module 10; i.e., safety transformational leadership, learning, transfer). Responses related to practice were collected during modules 3 and 7. Participants answered all study questions via a tablet that automatically sent responses through 3G signals to a remote electronic database. Individual data were confidential and only viewed by members of a third-party consulting firm and not by any member of the trainees' organizations.

## **Measures**

The current study examined trainee readiness factors (training self-efficacy, learning goal orientation, motivation to learn), supervisor support for transfer (safety transformational leadership behaviors), practice, and outcomes of training (learning, transfer). All variables were self-reported by training participants. The measures are described below and reproduced in the appendix.

*Training Self-Efficacy.* This six-item measure was adapted from Guthrie and Schwoerer (1994) to capture an individual's confidence in his or her ability to do well in training. These items were modified from the original source to be relevant to the training program measured in the current study. Sample items include "I will be able to apply what I have learned in this training program" and "I am confident that I can succeed in this training program". Responses were indicated using a seven-point Likert rating scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores representing greater training self-efficacy. In the current study, the internal consistency reliability estimate for this scale was .95.

*Learning Goal Orientation.* Four items adapted from Grant and Dweck (2003) were used to measure learning goal orientation. These items were modified from the original source to be relevant to a work context, rather than a school environment. Example items include "At work I focus on developing my abilities and acquiring new ones" and "I strive to constantly learn and improve at work". These items were rated on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores representing a stronger learning goal orientation. In the current study, this scale had an internal consistency reliability estimate of .90.

*Motivation to Learn.* Six items from Noe and Schmitt (1986) were included to measure trainees' motivation to learn. These items were modified from their original format to be relevant to the training program measured in the current study. Sample items are "I intend to learn the concepts in this training program" and "I will try to learn as much as I can from this training program". Items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores representing greater motivation to learn. In the current study, the internal consistency reliability estimate for this scale was .90.

*Safety Transformational Leadership*.<sup>4</sup> Ten items from Barling et al. (2002) were utilized to measure safety transformational leadership. Barling et al. adapted these items from Bass and Avolio's (1990) Multifactor Leadership Questionnaire in order to capture individual perceptions of supervisor transformational leadership behaviors *specific to safety*. These ten items included four sub-factors of transformational leadership (idealized influence, intellectual stimulation, inspiration motivation, and individualized consideration) and one sub-factor of transactional leadership (contingent reward). Barling et al. included two contingent reward items in this scale due to previous findings that contingent reward and the four transformational leadership dimensions are highly correlated (e.g., Avolio, Bass, & Jung, 1999) and frequently load together in factor analyses (e.g., Bycio, Hackett, & Allen, 1995; Carless, 1998). An example intellectual stimulation item is "My supervisor encourages me to express my ideas and opinion about safety at work", and an example individualized consideration item is "My supervisor would listen to my concerns about safety on the job". Items were rated on a five-point Likert scale ranging from 1 (not at all) to 5 (frequently or always), with higher scores representing greater safety transformational leadership.

In order to assess whether safety transformational leadership is best understood as a one-dimensional variable (i.e., all ten items load together) or a multi-dimensional variable (i.e., items load onto their respective subscales), I conducted a confirmatory factor analysis (CFA) using the EQS software program (Bentler, 2005). For this analysis, I utilized maximum likelihood estimation procedures and three indices of model fit: the comparative fit index (CFI), nonnormed

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<sup>4</sup> While I am measuring safety transformational leadership (a leadership construct) in the current study, I am specifically interested in *supervisors*. Thus, I am treating safety transformational leaders as analogous to safety transformational supervisors. I believe it is appropriate to use the measure in this way because it is better to utilize an empirically-driven measure of a similar construct (leaders are similar to supervisors), than use a non-validated measure for the target group I am interested in (supervisors).

fit index (NNFI), and root-mean-square-error of approximation (RMSEA). A measurement model is considered to be a ‘good fit’ when the CFI and NNFI indices are close to 1 (estimates range from 0 to 1 and higher values indicate better fit; Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004) and the RMSEA value is less than .08 (values from .05 to .08 represent reasonable fit and values below .05 represent close fit; Kline, 2004). I also conducted a chi-square difference test to evaluate whether there was a significant improvement in fit between the two different measurement models (in this case, comparing the one-factor safety transformational leadership model with the five-factor safety transformational leadership model). Overall, the best-fitting model was chosen based on the following criteria: (1) support from the goodness of fit indices and chi-square difference test, (2) a low chi-square value, and (3) a priori theory. CFA results suggest that the five-factor safety transformational leadership measurement model fit the data better (CFI = .97, NNFI = .94, RMSEA = .12, and  $\chi^2(25) = 95.60$ ) than the one-factor safety transformational leadership model (CFI = .90, NNFI = .87, RMSEA = .17, and  $\chi^2(35) = 238.78$ ). Moreover, results from the chi-square difference test suggested there is a statistically significant difference between the fit of these two models ( $\Delta\chi^2 = 143.18, p = .00$ ). All in all, these results support the use of a multi-dimensional index of safety transformational leadership (consisting of five independent but related subscales). In the current study, the internal consistency reliability estimate for each safety transformational leadership subscale was as follows: .84 (contingent reward), .93 (inspiration motivation), .86 (intellectual stimulation), .89 (idealized influence), and .70 (individualized consideration).

*Practice.* In order to capture whether trainees practiced using their training-related knowledge and skills at work (throughout the 31 days of training), I included a single self-report practice question: “Think back to the commitments you have made in earlier modules. To what

extent have you practiced any goal-related skills and behaviors?” This item was answered by training participants at two time points across the training program (during modules 3 and 7). Additionally, practice was rated on a 5-point Likert style ranging from 1 (never) to 5 (very frequently), and responses across the two time points were averaged together to create a single practice scale score for each trainee. Overall, 91% of trainees practiced training-related knowledge and skills throughout the training process, between ‘occasionally’ and ‘very frequently’ ( $M = 3.52$ ,  $SD = .66$ ).

*Self-Reported Learning.* One important outcome to assess in the context of training is how much participants learn as a result of their developmental experiences. Five items were developed (by myself and the other training designers) to cover the key learning objectives of the current safety training program. Example items include: “I learned new ways to think about my safety in this training program” and “After going through this training program, I now understand how my safety attitudes and behaviors are linked”. All items were rated on a 5-point Likert style ranging from 1 (strongly disagree) to 5 (strongly agree), and were averaged together to create a single learning scale score for each trainee. In the current study, this scale had an internal consistency reliability estimate of .94.

*Training Transfer Behaviors.* Six items were used to capture the application of training knowledge and skills on the job. These items were adapted from their original sources (Machin & Fogarty, 2004 and Al-Eisa Furayyan, & Alhemoud, 2009) to be relevant to the current training program and reflect “actual” behavior rather than behavioral intentions. All items were rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), and averaged together to create a single training transfer scale score for each participant. Example items are: “I have discussed with my supervisor ways to apply the material that I have learned in this training

program” and “I have used the knowledge and skills I learned in this training program on the job”. In the current study, this scale had an internal consistency reliability estimate of .95.

*Training Transfer Applied Index.* In addition to assessing training transfer with the measure described above (using a Likert scale), I also measured transfer using two multiple-choice items. In doing so, I hoped to provide additional rigor (and another methodological approach) for assessing transfer in the current study. Training participants learned a variety of psychological safety concepts throughout the duration of this program. Thus, one way to capture transfer was to measure how many of these concepts individuals actually applied, either at home or on the job. For example, one of the items was: “Select which concepts you have applied or put into action in some way at home or at work (check all those that apply): Reasons to Care, Safety Culture, DVR, Gorillas/Blind Spots, Magic 7, Multi-tasking/Magic 7 Overload, Playlists, Frames.” An overall training transfer applied index score was calculated by summing up the total number of selected responses across both items (the highest possible score was 15). Across all trainees, the average training transfer applied index score was 5.04 ( $SD = 2.94$ ).

## RESULTS

Descriptive statistics, zero-order correlations, and reliabilities for all variables measured in the current study can be found in Table 1. Overall, analyses were conducted on data from 201 employees who went through a 31-day safety training program.

### Main Effects

Hypothesis 1, which posited that training self-efficacy would be positively associated with learning (H1a) and training transfer (H1b), was tested using hierarchical regression analyses. For Hypothesis 1a, I entered the control variable in step 1 (trainee organization, either organization A (mining) or organization B (manufacturing)) and training self-efficacy in step 2 (the main predictor of interest). The addition of training self-efficacy to the model produced a significant increase in  $R^2$  of .18 ( $p=.00$ ). Thus, in support of Hypothesis 1a, there was a positive relationship between training self-efficacy and learning ( $B = .35$ ). Next, in order to test Hypothesis 1b, I ran two hierarchical regression analyses, one analysis with training transfer 1 (the training transfer behavior scale) as the dependent variable and another analysis with training transfer 2 (the training transfer applied index) as the outcome of interest. For both analyses, I entered the control variable in step 1 (trainee organization) and training self-efficacy in step 2. Training self-efficacy accounted for a significant amount of variance explained in training transfer 1 ( $\Delta R^2 = 19\%$ ,  $p = .00$ ) and training transfer 2 ( $\Delta R^2 = 7\%$ ,  $p = .00$ ). Thus, in support of Hypothesis 1b, training self-efficacy was a significant predictor of both indices of transfer; training transfer 1 ( $B = .73$ ) and training transfer 2 ( $B = .95$ ). All in all, Hypothesis 1 was fully supported, with findings that training self-efficacy positively predicts learning and transfer in a mobile technology-based training program (see Table 2 for more information).

Hypothesis 2, which posited a positive relationship between learning goal orientation and learning (H2a) and transfer (H2b), was also tested with hierarchical regression analyses. For Hypothesis 2a, I entered the control variable in step 1 (trainee organization) and learning goal orientation in step 2 (the key independent variable). As shown in Table 3, learning goal orientation accounted for a significant amount of variance explained in learning ( $\Delta R^2 = 8\%$ ,  $p = .00$ ). Thus, in support of Hypothesis 2a, there was a positive relationship between learning goal orientation and learning ( $B = .31$ ). Second, I tested Hypothesis 2b by running two more hierarchical regression analyses with training transfer 1 and training transfer 2 as the outcome variables. Once again, I entered the control variable in step 1 (trainee organization) and learning goal orientation in step 2 (see Table 3). The addition of learning goal orientation to the model produced a significant increase in  $R^2$  of .09 ( $p = .00$ ; with transfer 1 as the dependent variable) and a significant increase in  $R^2$  of .06 ( $p = .00$ ; with transfer 2 as the dependent variable). Thus, in support of Hypothesis 2b, learning goal orientation positively predicted two indicators of transfer; training transfer 1 ( $B = .70$ ) and training transfer 2 ( $B = 1.21$ ). Overall, these analyses provide full support for Hypothesis 2, suggesting that learning goal orientation is a positive predictor of both learning and transfer in a 31-day, mobile technology-based safety training program.

Finally, Hypothesis 3, which proposed that motivation to learn would be positively associated with learning (H3a) and training transfer (H3b), was also tested with hierarchical regression analyses. For Hypothesis 3a, I entered the control variable in step 1 (trainee organization) and motivation to learn in step 2 (the main predictor of interest). The addition of motivation to learn to the model produced a significant increase in  $R^2$  of .19 ( $p = .00$ ). Thus, in support of Hypothesis 3a, there was a positive relationship between motivation to learn and

learning ( $B = .57$ ). Next, in order to test Hypothesis 3b, I ran two hierarchical regression analyses, with training transfer 1 and training transfer 2 as the dependent variables. For both analyses, I entered the control variable in step 1 (trainee organization) and motivation to learn in step 2. Motivation to learn accounted for a significant amount of variance explained in transfer 1 ( $\Delta R^2 = 19\%$ ,  $p = .00$ ) and transfer 2 ( $\Delta R^2 = 4\%$ ,  $p = .01$ ). Thus, in support of Hypothesis 3b, motivation to learn was a significant predictor of two unique indicators of transfer: training transfer 1 ( $B = 1.18$ ) and training transfer 2 ( $B = 1.07$ ). Overall, Hypothesis 3 was fully supported, with evidence that motivation to learn positively predicts learning and transfer in a mobile technology-based training program (see Table 4 for more information).

As a follow-up, I also conducted post-hoc analyses (i.e., relative importance analyses) to explore which readiness characteristic (training self-efficacy, learning goal orientation, or motivation to learn) had the strongest impact on post-training outcomes. Relative importance analyses can be calculated in a variety of ways, and for the current study I utilized general dominance weights (see Azen & Budescu, 2003 for a review on this statistical approach).<sup>5</sup> As shown in Table 5, results indicate that motivation to learn and training self-efficacy accounted for the most variance in learning (motivation to learn, 47.7%; training self-efficacy, 45.5%), with learning goal orientation only explaining 6.8% of learning variance. In other words, findings revealed that motivation to learn (followed closely by training self-efficacy) was the strongest predictor of learning in the current study. Additionally, as shown in Table 6, motivation to learn

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<sup>5</sup> A relative importance analysis can be examined by looking at either general dominance weights or relative weights. Although general dominance weights and relative weights are computed differently, these analytic approaches are conceptually equivalent (Azen & Budescu, 2003), resulting in very similar estimates of relative importance (e.g., Johnson, 2000). To contrast these two approaches, general dominance weights are calculated by examining the unique contributions of each predictor across all possible regression models (Azen & Budescu, 2003), whereas relative weights are computed by creating variable transformations (Johnson, 2000).

and training self-efficacy each accounted for 45.7% of the variance in transfer 1, while learning goal orientation only accounted for 8.7% of the variance in transfer 1. These findings indicated that once again, both motivation to learn and training self-efficacy were the best predictors of training transfer (as measured by the training transfer behavior scale, training transfer 1). Lastly, in terms of predicting training transfer 2 (the training transfer applied index), results demonstrated that training self-efficacy explained 43.9% of the variance, learning goal orientation explained 39.4% of the variance, and motivation to learn explained 16.7% of the variance (see Table 7 for more information). In other words, training self-efficacy had the strongest influence on training transfer 2. Overall, this evidence suggests that training self-efficacy and motivation to learn are the best predictors of three key indicators of training effectiveness.

Taken all together, hierarchical regression results provide full support for Hypotheses 1, 2, and 3. Findings reveal that three trainee readiness characteristics (training self-efficacy, learning goal orientation, motivation to learn) positively predict post-training outcomes (learning and transfer). Moreover, post-hoc analyses highlight that two of these readiness factors, training self-efficacy and motivation to learn, have the strongest impact on training success. These results contribute to the literature by demonstrating the importance of trainee readiness within the context of a mobile technology-based training program.

### **Interaction Effects**

The next set of hypotheses test for interaction effects in my proposed model. Hypothesis 4 predicted that the relationship between safety transformational leadership and trainee effectiveness outcomes would be dependent upon one's level of training self-efficacy. To test this hypothesis, I conducted several hierarchical regression analyses with the control variable

(trainee organization) in step 1, training self-efficacy and safety transformational leadership (either contingent reward, inspiration motivation, intellectual stimulation, idealized influence, or individualized consideration; main effects) in step 2, and the interaction between training self-efficacy and each safety transformational leadership subscale in step 3. There were no significant interactions between training self-efficacy and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.03$ ,  $t = -.79$ ,  $p = .43$ ), training self-efficacy and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = -.02$ ,  $t = -.62$ ,  $p = .54$ ), training self-efficacy and intellectual stimulation ( $\Delta R^2 = .01$ ,  $B = -.04$ ,  $t = -1.07$ ,  $p = .28$ ), training self-efficacy and idealized influence ( $\Delta R^2 = .00$ ,  $B = .01$ ,  $t = .36$ ,  $p = .72$ ), or training self-efficacy and individualized consideration ( $\Delta R^2 = .00$ ,  $B = -.04$ ,  $t = -.89$ ,  $p = .37$ ) in predicting learning. Additionally, when predicting training transfer 1, the interaction between training self-efficacy and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.03$ ,  $t = -.36$ ,  $p = .72$ ), training self-efficacy and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = .02$ ,  $t = .31$ ,  $p = .76$ ), training self-efficacy and intellectual stimulation ( $\Delta R^2 = .00$ ,  $B = .00$ ,  $t = -.01$ ,  $p = .99$ ), training self-efficacy and idealized influence ( $\Delta R^2 = .00$ ,  $B = .07$ ,  $t = .84$ ,  $p = .40$ ), and training self-efficacy and individualized consideration ( $\Delta R^2 = .00$ ,  $B = .01$ ,  $t = .15$ ,  $p = .88$ ) were not significant. Finally, there were no significant interactions between training self-efficacy and contingent reward ( $\Delta R^2 = .00$ ,  $B = .02$ ,  $t = .13$ ,  $p = .90$ ), training self-efficacy and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = .10$ ,  $t = .58$ ,  $p = .57$ ), training self-efficacy and intellectual stimulation ( $\Delta R^2 = .00$ ,  $B = .06$ ,  $t = .32$ ,  $p = .75$ ), training self-efficacy and idealized influence ( $\Delta R^2 = .00$ ,  $B = .15$ ,  $t = .84$ ,  $p = .40$ ), or training self-efficacy and individualized consideration ( $\Delta R^2 = .00$ ,  $B = .02$ ,  $t = .12$ ,  $p = .90$ ), in predicting training transfer 2. Overall, I found no support for Hypothesis 4; training self-efficacy did not moderate

the relationships between safety transformational leadership behaviors and trainee effectiveness outcomes.

Next, I tested Hypothesis 5, which proposed that learning goal orientation would positively moderate the relationship between safety transformational leadership and two indicators of trainee effectiveness: learning and transfer. I ran hierarchical regression analyses with the control variable (trainee organization) in step 1, learning goal orientation and each of the safety transformational leadership subscales (independent effects) in step 2, and the interaction terms (learning goal orientation X safety transformational leadership behaviors) in step 3, for each of the dependent variables (learning, transfer 1, transfer 2). Analyses indicated that none of the interaction effects were significant. In other words, when predicting learning, the interaction between learning goal orientation and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.05$ ,  $t = -.92$ ,  $p = .36$ ), learning goal orientation and inspiration motivation ( $\Delta R^2 = .01$ ,  $B = -.07$ ,  $t = -1.05$ ,  $p = .29$ ), learning goal orientation and intellectual stimulation ( $\Delta R^2 = .01$ ,  $B = -.07$ ,  $t = -1.06$ ,  $p = .29$ ), learning goal orientation and idealized influence ( $\Delta R^2 = .00$ ,  $B = -.03$ ,  $t = -.52$ ,  $p = .61$ ), and learning goal orientation and individualized consideration ( $\Delta R^2 = .01$ ,  $B = -.08$ ,  $t = -1.25$ ,  $p = .21$ ), were not significant. Furthermore, there were no significant interactions between learning goal orientation and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.05$ ,  $t = -.43$ ,  $p = .67$ ), learning goal orientation and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = .04$ ,  $t = .31$ ,  $p = .76$ ), learning goal orientation and intellectual stimulation ( $\Delta R^2 = .00$ ,  $B = -.08$ ,  $t = -.66$ ,  $p = .51$ ), learning goal orientation and idealized influence ( $\Delta R^2 = .00$ ,  $B = .00$ ,  $t = -.01$ ,  $p = .99$ ), or learning goal orientation and individualized consideration ( $\Delta R^2 = .00$ ,  $B = -.07$ ,  $t = -.54$ ,  $p = .59$ ) in predicting transfer 1. Finally, when predicting training transfer 2, the interaction between learning goal orientation and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.12$ ,  $t = -.47$ ,  $p = .64$ ), learning goal

orientation and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = .03$ ,  $t = .12$ ,  $p = .91$ ), learning goal orientation and intellectual stimulation ( $\Delta R^2 = .00$ ,  $B = -.13$ ,  $t = -.45$ ,  $p = .65$ ), learning goal orientation and idealized influence ( $\Delta R^2 = .00$ ,  $B = .08$ ,  $t = .28$ ,  $p = .78$ ), and learning goal orientation and individualized consideration ( $\Delta R^2 = .00$ ,  $B = -.13$ ,  $t = -.44$ ,  $p = .66$ ), were not significant. Overall, these results suggest that the relationships between all five subscales of safety transformational leadership behaviors and trainee effectiveness are not dependent on a trainee's learning goal orientation. Consequently, there is no support for Hypothesis 5.

Finally, I tested Hypothesis 6, which proposed that the relationship between safety transformational leadership and trainee effectiveness outcomes would be dependent upon one's motivation to learn. To test this hypothesis, I conducted hierarchical regression analyses (for each dependent variable) with the control variable (trainee organization) in step 1, motivation to learn and each safety transformational leadership dimension (main effects) in step 2, and the interaction between motivation to learn and safety transformational leadership subscales in step 3. There were no significant interactions between motivation to learn and contingent reward ( $\Delta R^2 = .01$ ,  $B = -.09$ ,  $t = -1.36$ ,  $p = .18$ ), motivation to learn and inspiration motivation ( $\Delta R^2 = .01$ ,  $B = -.10$ ,  $t = -1.54$ ,  $p = .13$ ), motivation to learn and intellectual stimulation ( $\Delta R^2 = .02$ ,  $B = -.12$ ,  $t = -1.87$ ,  $p = .06$ ), motivation to learn and idealized influence ( $\Delta R^2 = .00$ ,  $B = -.07$ ,  $t = -.99$ ,  $p = .32$ ), or motivation to learn and individualized consideration ( $\Delta R^2 = .01$ ,  $B = -.13$ ,  $t = -1.83$ ,  $p = .07$ ), in predicting learning. Additionally, when predicting training transfer 1, the interactions between motivation to learn and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.13$ ,  $t = -1.00$ ,  $p = .32$ ), motivation to learn and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = -.08$ ,  $t = -.63$ ,  $p = .53$ ), motivation to learn and intellectual stimulation ( $\Delta R^2 = .01$ ,  $B = -.21$ ,  $t = -1.57$ ,  $p = .12$ ), motivation to learn and idealized influence ( $\Delta R^2 = .00$ ,  $B = -.12$ ,  $t = -.83$ ,  $p = .41$ ), and motivation to learn and individualized

consideration ( $\Delta R^2 = .01$ ,  $B = -.20$ ,  $t = -1.36$ ,  $p = .18$ ) were not significant. Finally, there were no significant interactions between motivation to learn and contingent reward ( $\Delta R^2 = .00$ ,  $B = -.01$ ,  $t = -.05$ ,  $p = .96$ ), motivation to learn and inspiration motivation ( $\Delta R^2 = .00$ ,  $B = .16$ ,  $t = .51$ ,  $p = .61$ ), motivation to learn and intellectual stimulation ( $\Delta R^2 = .00$ ,  $B = -.10$ ,  $t = -.31$ ,  $p = .76$ ), motivation to learn and idealized influence ( $\Delta R^2 = .00$ ,  $B = .11$ ,  $t = .34$ ,  $p = .74$ ), or motivation to learn and individualized consideration ( $\Delta R^2 = .00$ ,  $B = -.19$ ,  $t = -.53$ ,  $p = .60$ ), in predicting training transfer 2. Overall, I found no support for Hypothesis 6; motivation to learn did not moderate the relationships between safety transformational leadership subscales and trainee effectiveness outcomes.

In summary, hierarchical regression analyses do not support Hypotheses 4, 5, or 6. In other words, results indicate that the link between safety transformational leadership and post-training outcomes (learning, transfer) is not dependent upon one's readiness for training (training self-efficacy, learning goal orientation, motivation to learn).

### **Additional Analyses**

Interestingly, post-hoc analyses revealed a significant main effect for each of the safety transformational leadership dimensions on learning and transfer. Hierarchical regression analyses revealed a positive relationship between contingent reward and learning ( $\Delta R^2 = 11.6\%$ ,  $B = .20$ ,  $p = .00$ ), inspiration motivation and learning ( $\Delta R^2 = 6.4\%$ ,  $B = .15$ ,  $p = .00$ ), intellectual stimulation and learning ( $\Delta R^2 = 7.5\%$ ,  $B = .17$ ,  $p = .00$ ), idealized influence and learning ( $\Delta R^2 = 9\%$ ,  $B = .19$ ,  $p = .00$ ), and individualized consideration and learning ( $\Delta R^2 = 11.9\%$ ,  $B = .22$ ,  $p = .00$ ). These results are displayed in Table 8. Moreover, each dimension of safety transformational leadership was also predictive of training transfer 1 (see Table 9 for more information): contingent reward ( $\Delta R^2 = 12.6\%$ ,  $B = .43$ ,  $p = .00$ ), inspiration motivation ( $\Delta R^2 = 8.2\%$ ,  $B = .36$ ,  $p = .00$ ),

intellectual stimulation ( $\Delta R^2 = 10.3\%$ ,  $B = .41$ ,  $p = .00$ ), idealized influence ( $\Delta R^2 = 12.7\%$ ,  $B = .47$ ,  $p = .00$ ), and individualized consideration ( $\Delta R^2 = 13.9\%$ ,  $B = .50$ ,  $p = .00$ ). Lastly, all five safety transformational leadership subscales (contingent reward,  $\Delta R^2 = 7.8\%$ ,  $B = .71$ ,  $p = .00$ ; inspiration motivation,  $\Delta R^2 = 3.3\%$ ,  $B = .47$ ,  $p = .01$ ; intellectual stimulation,  $\Delta R^2 = 5\%$ ,  $B = .60$ ,  $p = .00$ ; idealized influence,  $\Delta R^2 = 6.4\%$ ,  $B = .69$ ,  $p = .00$ ; individualized consideration,  $\Delta R^2 = 4\%$ ,  $B = .55$ ,  $p = .01$ ) were also significantly related to training transfer 2 (see Table 10).

Although these direct relationships were not initially hypothesized, such findings provide insight regarding the influential role of safety transformational leadership behaviors on the transfer process. More specifically, one recommendation for organizations striving to achieve a strong ROI from safety training is teaching supervisors to support trainees through demonstrating and encouraging positive work-related safety attitudes and behaviors.

With strong relationships between all five subscales of safety transformational leadership and all three outcome variables (learning, transfer 1, transfer 2), I decided to conduct relative importance analyses to better understand which element of safety transformational leadership was the best predictor of training success. Results from the relative importance analyses are presented in Tables 11, 12, and 13. When predicting learning, results suggested that both contingent reward and individualized consideration accounted for 30.1% of the variance, intellectual stimulation and idealized influence accounted for 15.5% of the variance, and inspiration motivation accounted for 8.8% of the variance (see Table 11 for more information). In other words, contingent reward and individualized consideration were the best predictors of learning, given that these two safety transformational leadership behaviors explained the most variance in the dependent variable. Additionally, as shown in Table 12, individualized consideration accounted for 27.6% of the variance, contingent reward accounted for 24.8% of the

variance, idealized influence accounted for 22.0% of the variance, intellectual stimulation accounted for 14.2% of the variance, and inspiration motivation accounted for 11.4% of the variance, in training transfer 1. These findings indicated that individualized consideration was the best predictor of training transfer (as measured by the training transfer behavior scale, training transfer 1). Lastly, in terms of predicting training transfer 2, results suggested that contingent reward explained 38.5% of the variance, idealized influence explained 24.1% of the variance, intellectual stimulation explained 13.5% of the variance, and inspiration motivation and individualized consideration explained 12.0% of the variance in transfer 2 (see Table 13 for more information). In other words, contingent reward was the best predictor of training transfer 2. Overall, this evidence suggests that contingent reward and individualized consideration are the strongest predictors of key trainee outcomes. A more detailed interpretation of these results will be presented in the discussion section.

### **Mediation Effects**

Finally, I proposed several research questions to explore the mediating effects of practice on the relationship between trainee readiness factors and trainee effectiveness outcomes. Although I intended to explore these mediation effects using the bootstrapping approach outlined by Preacher and Hayes (2004), it was first necessary to assess whether mediation was even appropriate (i.e., were the constructs of ‘practice’ and ‘transfer’ in this study truly distinct from one another?). Thus, I ran a CFA using the EQS software program (Bentler, 2005) to test whether the constructs of practice and transfer are best understood as two indicators of the same second-order construct (i.e., load together on one general factor of ‘overall transfer’). I utilized maximum likelihood estimation procedures and three different indices of model fit including the comparative fit index (CFI), the nonnormed fit index (NNFI), and root-mean-square-error of

approximation (RMSEA). Overall, CFA results suggested that a one-factor model (CFI = .96, NNFI = .94, RMSEA = .15, and  $\chi^2(9) = 51.36$ ) fit the data well. Further, an exploratory factor analysis of practice and transfer provided evidence that one factor accounted for 75% of the variance and all items had high factor loadings (ranging from .50 - .94). Finally, a correlation analysis revealed significant relationships between the one practice item and all five transfer items (with correlations ranging from .38 - .48), and a reliability analysis indicated strong item-total correlations across all practice and transfer items (ranging from .48 - .91). All in all, these results suggest that the two variables of practice and transfer measured in the current study are likely indicators of a single construct. That is, analytical findings indicate that ‘practice’ was indistinguishable from ‘transfer’ and since it is inappropriate to have a variable mediate itself, I was not able to run the mediation analyses. Thus, Research Question 1 could not be tested. A more thorough interpretation of these findings will be presented in the discussion section below.

## DISCUSSION

In today's business world, too many organizations invest precious resources in training and development, yet fail to achieve the results they want. *Why is this the case?* One plausible explanation is the lack of attention to key individual and organizational elements that impact training success. Consequently, the current study explored how trainee readiness, supervisor support, and practice foster transfer in a mobile technology-based training program. Data were collected from 201 frontline workers, from two organizations in the United States and Canada, who took part in a 10-module safety training program delivered via tablet computers. Results demonstrated that trainee readiness characteristics (training self-efficacy, learning goal orientation, motivation to learn) significantly predicted multiple indicators of training effectiveness (learning, transfer). Additionally, relative importance analyses revealed that both training self-efficacy and motivation to learn exerted the strongest influence on learning and transfer, whereas learning goal orientation explained the least amount of variance in these dependent variables. Next, my results failed to support the expected interaction between supervisor support (operationalized as perceptions of supervisor safety transformational leadership behaviors) and trainee readiness characteristics in boosting training success. However, post-hoc analyses revealed strong main effects between all five safety transformational leadership behaviors (contingent reward, inspiration motivation, intellectual stimulation, idealized influence, individualized consideration) and post-training outcomes. Moreover, across all elements of safety transformational leadership, relative importance analyses indicated that individualized consideration and contingent reward were the two strongest predictors of the outcome variables measured in this study. Finally, a variety of statistical tests (i.e., confirmatory

factor analysis, exploratory factor analysis, correlation analysis, reliability analysis) suggested that the variables of practice and transfer were likely two indicators of the same construct (or indistinguishable), thus making it impossible to test for mediation effects.

Overall, this study makes several contributions to the training literature. First, although existing evidence suggests that supervisor support is related to training success (e.g., Brinkerhoff & Montesino, 1995; Broad & Newstrom, 1992), there is currently a lack of clarity regarding the specific supportive actions that are most critical (e.g., Baldwin & Ford, 1988; Clarke, 2002; Foxon, 1997; Quiñones et al., 1995). My study adds to the literature by leveraging transformational leadership theory to provide insights regarding what it means to be supportive within a safety training context. Specifically, I operationalized support in terms of five key supervisory behaviors: Contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration.

Second, the current study makes a unique contribution by expanding the nomological network of safety transformational leadership. Although in its infancy as a construct (see Barling et al., 2002; Kelloway, et al., 2006; Mullen & Kelloway, 2009 for extant research evidence), safety transformational leadership has been linked to several important outcomes including occupational injuries (Barling et al., 2002; Kelloway et al., 2006), safety-related events (Mullen & Kelloway, 2009), and safety attitudes and behaviors (Mullen & Kelloway, 2009). To the best of my knowledge, no research has directly explored the role of safety transformational leadership in a *training* context. Thus, by examining whether safety transformational leadership behaviors accelerate training success, I contribute to both research (by shedding light on how supervisors affect post-training outcomes) and practice (by informing recommendations for organizations on how to best support trainees) on training transfer.

Third, another goal of the current study was to help clarify the boundary conditions of the supervisor support – training transfer relationship. Given inconsistent findings regarding the link between supervisor support and training transfer (for example, both Chiaburu et al., 2010 and Cromwell & Kolb, 2004 found a strong, positive relationship, whereas Awoniyi et al., 2002 and Facticeau et al., 1995 found no relationship), I explored other potential mechanisms that might explain these mixed findings. With evidence that certain people may be more ‘ready’ for training, and thus more likely to benefit from developmental experiences (e.g., Baldwin et al., 2009; Burke & Hutchins, 2007), research suggests that the likelihood of training success can be enhanced when one accounts for these individual difference factors (Mathieu & Martineau, 1997). As such, I contribute to the transfer literature by exploring one potential moderating variable of the supervisor support – transfer relationship: trainee readiness.

Fourth, this study evaluates the effectiveness (in terms of learning and transfer) of a mobile technology-based training program. In the literature there has been a call to investigate how technology is influencing the way people are trained in the workplace (e.g., Baldwin et al., 2009), and unfortunately, the empirical research has lagged behind organizational reality (Brown, 2001; Welsh et al., 2003). By leveraging an innovative training platform, this study is the first to explore strategies for maximizing training effectiveness in a tablet computer-based, organizational training program.

As highlighted above, the current research makes several valuable contributions to the training transfer literature. In the following sections, I will discuss key findings and the implications of these results for both academics and practitioners.

### **Implications of Hypotheses 1-3**

To begin, Hypotheses 1, 2, and 3 were fully supported. More specifically, when testing Hypothesis 1, I found evidence that training self-efficacy positively predicted three indices of training effectiveness: learning, training transfer 1, and training transfer 2. These findings suggest that a trainee who is confident in his or her ability to learn and succeed in training (i.e., training self-efficacy; Guthrie & Schwoerer, 1994; Robbins & Judge, 2009), is more likely to gain knowledge after going through a learning experience and actually apply that knowledge in the workplace. Consistent with extant theory, I found strong support that training self-efficacy was a key readiness characteristic in a mobile technology-based training program.

Next, I also found support for my second hypothesis that learning goal orientation would be positively predictive of both learning and transfer in a training program leveraging mobile technology. Results from the current study indicate that an individual who is willing to put forth extensive effort to learn as much as possible in an achievement-oriented environment (i.e., learning goal orientation; Button et al., 1996; Dweck & Leggett, 1988), is more likely to gain new knowledge and transfer that learning on the job. Furthermore, it is likely that my findings for Hypothesis 2 are conservative because the learning goal orientation scale utilized in the current study (see appendix) targets the work environment in general, and not specifically a learning or training context. In contrast, the scales for training self-efficacy and motivation to learn (see appendix) specifically targeted the training program assessed in this study. Consequently, future researchers may observe even stronger relationships between learning goal orientation and training outcomes if all measures are assessed at the same level of specificity (thus avoiding the bandwidth fidelity dilemma; e.g., Austin & Villanova, 1992). Overall, evidence from this research strongly suggests that learning goal orientation is another key readiness characteristic that influences training effectiveness.

My final trainee readiness hypothesis (Hypothesis 3) suggested that a trainee's motivation to learn would be related to post-training success. I found positive, significant relationships between a trainee's interest in and desire for learning new job-related knowledge and skills (i.e., motivation to learn; Noe, 1986; Noe & Schmitt, 1986) and one's level of learning and transfer after going through a 31-day mobile technology-based training program. Such findings indicate that motivation to learn is another readiness variable that is instrumental in accelerating training effectiveness.

In general, I found full support for Hypotheses 1, 2, and 3, demonstrating that pre-training factors, like trainee readiness, can have a huge influence on post-training outcomes. Furthermore, relative importance analyses revealed that two of these characteristics explained the most variance in learning and transfer: training self-efficacy and motivation to learn. These findings have numerous practical implications for today's organizations. As discussed by Machin (2002), maximizing trainee readiness (before training even starts), helps ensure that: (1) Individuals are prepared to fully engage in a learning experience, and (2) training resources are distributed to those who will benefit most from development. Thus, in accordance with Machin's first claim, one organizational strategy to "make training stick" is spending time and money upfront to enhance individuals' training self-efficacy and motivation to learn (because these two readiness factors exhibited the strongest impact on post-training outcomes).

To elaborate, Chiaburu and colleagues (Chiaburu & Marinova, 2005; Chiaburu et al., 2010) suggested that organizations should invest in pre-training interventions that help boost one's level of self-efficacy. Such interventions may include teaching employees verbal persuasion strategies (e.g., Bandura, 1986), assisting individuals with goal setting (e.g., Richman-Hirsch, 2001), or helping trainees make external (rather than internal) attributions

when experiencing failure or unsuccessful results (e.g., Steiner, Dobbins, & Trahan, 1991). Additionally, Salas and colleagues (Grossman & Salas, 2011; Salas et al., 2012) highlighted that organizational interventions can help enhance individuals' motivation to learn in the workplace. Strategies for strengthening motivation to learn include explaining how a specific training program addresses core learning and development needs (e.g., Salas et al., 2012), and assisting individuals with goal setting at the beginning of a training engagement (e.g., Grossman & Salas, 2011; Robbins & Judge, 2009). Thus, strengthening individual readiness characteristics (especially training self-efficacy and motivation to learn) before one enters a learning process is likely to help foster positive training outcomes.

An additional approach for “making training stick” is distributing training resources to those who will benefit most from development (Machin's second claim). In other words, when an organization is figuring out who should participate in training, one deciding factor can be an individual's readiness for learning and development. Thus, by selecting individuals who are high in training self-efficacy, learning goal orientation, and/or motivation to learn to participate in a training program, the likelihood of success is enhanced before training even begins. As an example, Chiaburu and Marinova (2005) suggested selecting individuals into training based on their level of training self-efficacy, when multiple training sessions would be held. As such, employees who were high in training self-efficacy would be selected to participate in training first, while those lower in training self-efficacy would participate in training at a later point in time. This approach would allow highly self-efficacious individuals to serve as role models and examples of “success” to those who were lower in self-efficacy. Moreover, Grossman and Salas (2011) argued that selecting trainees based on a careful consideration of individual difference characteristics might be a helpful strategy that creates alignment across various organizational

practices (i.e., selection and training). Overall, results from Hypotheses 1-3 suggest that two strategies for “making training stick” include 1) designing pre-training interventions to enhance trainee readiness and 2) selecting individuals into training who are most ‘ready’ to learn and develop.

### **Implications of Hypotheses 4-6**

For Hypotheses 4-6, I proposed that the relationship between supervisor support and training outcomes would be moderated by one’s level of readiness for learning and development. More specifically, for Hypothesis 4, I suggested that training self-efficacy would influence the degree to which safety transformational leadership and post-training success were related, such that this relationship would be stronger for those higher in training self-efficacy. Findings indicated no significant interaction effects; the degree to which supervisor support for safety influenced key training outcomes was not dependent upon whether an individual trainee was confident in his or her ability to succeed in training. Moreover, I also found no support for Hypothesis 5, which proposed that the relationship between safety transformational leadership and post-training success would be moderated by learning goal orientation, such that this relationship would be stronger for those higher in learning goal orientation. By failing to find significant interaction effects, these results highlight that the link between perceptions of safety transformational leadership and post-training outcomes was not dependent upon a trainee’s willingness to learn as much as possible in training. Finally, interaction effects also failed to support Hypothesis 6; the relationships between safety transformational leadership and learning and transfer were not dependent upon a trainee’s motivation to learn. As such, the strength of the correlation between supervisor support for safety and key training outcomes was not influenced

by a trainee's desire to learn new job-related knowledge and skills. There are several plausible reasons for these null findings.

The first explanation is that there is in fact no substantive interaction between supervisor support (operationalized as safety transformational leadership) and trainee readiness characteristics in predicting training outcomes. While this explanation does not align with previous theory (e.g., Ford & Weissbein, 1997; Kozlowski & Salas, 1997) or prior findings (e.g., Pidd, 2004), it is possible that the context (a mobile technology-based training program) or the operationalization of support (safety transformational leadership) limited the interaction between supervisor support and readiness characteristics. Furthermore, instead of a moderated effect, post-hoc analyses revealed positive main effects between all five indicators of safety transformational leadership (contingent reward, inspiration motivation, intellectual stimulation, idealized influence, individualized consideration) and training effectiveness. Thus, another potential reason for these null findings is that by operationalizing supervisor support in terms of safety transformational leadership (i.e., using a theoretically-driven, behavior-based measure of support), it is plausible the supervisor support – transfer link is actually quite strong and not easily shaped by external influences (i.e., moderating factors).

A third explanation concerns other potential moderating variables that may be influencing the supervisor support – transfer relationship. While I explored three trainee readiness characteristics (training self-efficacy, learning goal orientation, motivation to learn) as moderators in the current study, it is possible there are other factors that may be influencing the strength of this relationship. Such variables may include utility reactions (e.g., are there meaningful differences in the support – transfer relationship due to perceptions of training utility?; see Axtell et al., 1997 for more information), technology anxiety (e.g., is the supervisor

support – transfer relationship dependent upon trainees’ level of anxiety toward the technology used in training?; see Meuter, Ostrom, Bitner, & Roundtree, 2003 for more information), or job involvement (e.g., does job involvement moderate the supervisor support – transfer link such that this relationship is stronger for those who have higher job identification?; see Pidd 2004 for more information). Future research should explore these (and other) potential moderating variables of the support – transfer relationship.

One additional explanation for these null findings is that I had a range restriction issue. My results, as previously discussed, revealed no significant interaction between safety transformational leadership and trainee readiness in predicting key training outcomes. As depicted in Table 1, the average score on the motivation to learn scale was 4.1 (out of 5), the average score on the learning goal orientation scale was 6.5 (out of 7), and the average score on the training self-efficacy scale was 6.2 (out of 7). With very high means for all three individual difference characteristics, it is possible that the reason I found no evidence for the moderating role of trainee readiness was because these participants were already quite ‘ready’ to engage in training, thus making it less likely to detect interactions. Future research should examine the moderating role of trainee readiness in a sample of employees with greater variability in their readiness for training.

Although I did not find any interaction effects between supervisor support and trainee readiness in the current research, there was strong evidence that all five elements of safety transformational leadership directly predicted learning and transfer. Additionally, relative importance analyses revealed that the two best predictors of training success were contingent reward and individualized consideration behaviors. Such findings have several practical implications for organizations. First, one evidence-based recommendation for organizational

leaders is that they can support individuals in safety training by rewarding achievement (i.e., engaging in contingent reward behaviors; Barling et al., 2002; Bass & Avolio, 1990). Two specific strategies are: 1) expressing satisfaction when individuals perform tasks safely; and 2) ensuring that individuals receive appropriate recognition when safety targets are achieved. Based on my findings, when leaders engage in contingent reward behaviors, they help “make training stick” in the workplace. Another evidence-based recommendation for organizational leaders is to spend time listening and supporting others’ needs (i.e., engaging in individualized consideration behaviors; Barling et al., 2002; Bass & Avolio, 1990). Two such strategies are: 1) spending time showing individuals the safest way to perform tasks at work; and 2) listening to individuals’ safety-related concerns in the workplace. Practically speaking, leaders can strongly support trainees, and foster greater training success, by: 1) rewarding trainee achievement; and 2) listening to and supporting trainees’ needs.

### **Implications of Research Question 1**

With limited research to draw upon, I proposed several research questions (1a-1c) around the construct of practice including: (a) Does practice mediate the relationship between training self-efficacy and transfer?, (b) Does practice mediate the relationship between learning goal orientation and transfer?, and (c) Does practice mediate the relationship between motivation to learn and transfer? Unfortunately, a confirmatory factor analysis, along with several other statistical tests, revealed that a one-factor model was a good fit for my variables of practice and transfer. As a result, I was unable to test for mediation effects.

First, since it is still unclear whether practice mediates the relationship between trainee readiness and post-training outcomes, it is important for future researchers to attempt to answer this research question. One strategy is to improve the measurement of “practice” in a real-world,

organizational training program. Although there is no real consensus on the best approach for operationalizing practice related to complex knowledge and skill development, a problem with my study could have been the use of a single item (“To what extent have you practiced any goal-related skills and behaviors?”) for measuring practice. One example of a more rigorous assessment comes from Weissbein et al. (2011) who measured practice in an organizational training program with a sixteen-item self-report scale including items like “thought specifically about how to achieve your goals” and “reviewed training materials and notes”. The authors found strong support that practice mediated the relationship between one readiness characteristic (motivation to learn) and transfer. Thus, future research investigating the role of practice in an organizational transfer process should use a psychometrically sound measure that adequately samples the content domain of practice, such as the scale developed by Weissbein et al.

Second, although I tried to assess the variable of practice as efficiently as possible so as not to burden the trainees, my results indicated that I did not measure practice distinctly from transfer in the current study (i.e., there was a measurement problem). Accordingly, I may have actually captured two temporally distinct aspects of *training transfer*. To elaborate, with disagreements in the academic literature about the nature of training transfer, Barnett and Ceci (2002) set out to create a comprehensive taxonomy of the transfer construct. Their proposed taxonomy suggested that the construct of transfer divides into two main factors. The first factor is the transfer content, which refers to what is actually transferred (either a learned skill, performance change, or memory demands). The second factor is the transfer context, which reflects when transfer happens (near vs. far) and where training is transferred (knowledge domain, physical context, temporal context, functional context, social context, modality). Of relevance to the current research is the temporal context. More specifically, Barnett and Ceci

described this dimension as the elapsed time between training and transfer phases (e.g., minutes, days, weeks, years, etc.), with near transfer (in terms of the temporal context) referring to activities that occur almost simultaneously and far transfer (in terms of the temporal context) referring to activities that are temporally distinct. Given these definitions, the constructs in my study may be best classified in terms of transfer with a near temporal context (i.e., my practice construct, which is measured at the same time trainees are being trained) and transfer with a far temporal context (i.e., my transfer construct, which is measured after trainees have completed training). Accurately categorizing these measures can help fuel future research on the role of the temporal context in the transfer process of a mobile technology-based training program. Overall, my findings related to Research Question 1 suggest that 1) researchers should invest in better operationalizing the construct of “practice” related to real-world, organizational skills, and 2) Barnett and Ceci’s taxonomy can inform future research exploring the application of training knowledge and skills, across different time points.

### **Limitations**

The current study also has several limitations. First, all study variables were self-reported by the employees participating in this study. One potential concern with this methodological approach is social desirability effects, or the idea that participants may have responded to study questions in a way that would be perceived favorably by others (like their supervisor, members of the third-party consulting firm, other training participants, etc.). This is a possible limitation in the current study, however I tried to minimize social desirability effects by embedding statements in the training like “Please answer these questions as honestly as possible” and “Your individual answers will be confidential and not viewed by anyone in your organization” to increase the likelihood of honest responding. In addition to social desirability, individuals’ stable

dispositional traits (i.e., positive affectivity and negative affectivity) could also be influencing self-reported response data. Future research can address this concern by controlling for affectivity. Finally, it is worth noting that I did not actually measure supervisor safety transformational leadership behaviors, but rather I measured employee perceptions of their supervisors' behaviors (i.e., all variables was self-reported by the training participants). Thus, it is possible that measuring "actual behavior" through observation or supervisor ratings could have resulted in a stronger or weaker effect on training outcomes than these perceptions. Taken all together, there are many potential limitations with self-report data and future research should address some of these issues.

Next, another concern with self-report data is common method bias, which is a potential limiting factor in psychological research where all variables of interest are collected from a single source (e.g., Podsakoff & Organ, 1986). Although it makes sense to gather trainee readiness variables (capturing individual differences) from the participants themselves, how much trainees practiced throughout the training process (practice), supervisor support for safety-related training (safety transformational leadership), knowledge acquired post-training (learning), and the extent to which trainees applied new knowledge and skills on the job (transfer), could have been collected from other data sources. In fact, a 2009 literature review from Baldwin et al. highlighted key advances in training transfer research, which included the improved measurement of transfer, through the use of non-self-report ratings of post-training performance. As some examples, research from Swezey, Perez, and Allen (1991) assessed transfer with speed of performance (i.e., faster performance indicated higher transfer), and Richman-Hirsch (2001) included supervisor and peer evaluations of trainee effectiveness. Moreover, within the safety realm, Smith-Jentsch et al. (2001) measured transfer with event-based performance ratings,

where trained assessors used behaviorally anchored rating scales (BARS) to measure transfer experienced by pilots going through a flight simulation. Despite mono-method concerns in the current study, one strength of my design was that data was collected at three temporally distinct time points (beginning of training, during training, post training). This methodological approach lessens some (but not all) of the problems of the same source data. Future studies should examine strategies for varying methods (e.g., self-report data, performance evaluation data, organizational records of accidents and injuries, etc.) and sources (e.g., self, peers, supervisors, etc.) of key variables in mobile technology-based training transfer research.

Second, as organizations adopt mobile technology for learning and development purposes (e.g., Sharples et al., 2009), there is a growing need for evidence-based best practices to ensure the effectiveness of these training programs. The current study was a step in the right direction, through an examination of transfer “accelerators” in a 31-day safety training program delivered via a tablet computer. However, one key limitation in this research was the lack of a control group. Given the increasing popularity of mobile learning training platforms, future studies should directly compare mobile technology-based training approaches with more traditional training approaches to gain clarity regarding which delivery media (face-to-face, online, mobile-technology, blended) is optimal for enhancing individual and organizational learning. Additional suggestions for future mobile technology training research include the use of both pre-and-post tests to capture change before and after training, and evaluating the contributions of specific tablet computer components such as embedded video and interactive, game-like exercises. There are innumerable opportunities for researchers to contribute to both the science and practice of mobile learning in the workplace.

A third limitation concerns the quality of the measurement tools used in this study. Due to organizational time restraints and client requests regarding minimal surveying of trainees, I could only include a small number of measures in the current study. By and large, the scales used in this research were adapted from the best available measures I could find. Yet, there were still several issues. First, I created my own assessments of several constructs including learning, training transfer (i.e., the training transfer applied index), and practice. Although I justified all of these choices, best practice is to utilize psychometrically sound, validated assessments. Future research should invest in the development of additional transfer-related assessment tools. Second, because I wanted to assess supervisor support for transferring safety-related knowledge and skills, I included a validated measure of safety transformational leadership behaviors (Barling et al., 2002). However, I was specifically interested in *supervisor* behaviors (rather than *leader* behaviors). Given that Barling et al.'s (2002) measure is all that exists, I treated safety transformational leaders as analogous to safety transformational supervisors. Future research on the similarities and differences of safety transformational leaders and safety transformational supervisors is needed. Third, I created a one-item practice scale to assess the degree to which trainees practiced newly acquired knowledge and skills throughout the training process. I decided to create my own measure of this construct because there is a dearth of empirically-validated tools of practice related to complex, organizational skills, and an existing (and validated) measurement tool of practice (Weissbein et al., 2011) was too lengthy to include. As a result of this decision, I experienced a significant measurement problem because my variable of practice was not distinct from my variable of transfer. Overall, this limitation highlights the need for valid measures in order to better understand accelerators of training transfer.

Fourth, there may be some difficulty generalizing the findings of this study to other organizations (outside of heavy industry) and training programs (beyond safety training) given the specific demographics of the current sample (i.e., employees working in heavy industry going through a 31-day tablet computer-based safety training program). The current study should be replicated using a national sample of employees to assess whether these relationships still exist across varying organizational training programs and work environments.

### **Future Research**

Despite these limitations, the current study offers interesting avenues for future research. With decades of research on organizational learning and development, it is evident that one of the keys to training success is carrying out a training needs analysis (TNA; Salas & Cannon-Bowers, 2001) at the very beginning of the development process. According to Goldstein (1993), a TNA creates an understanding of where in an organization training should take place (organizational analysis), who in the organization needs training (person analysis), and what content needs to be taught in training (job analysis). Further, there is an understanding that training transfer on the job is the ultimate indicator of training success (e.g., Baldwin & Ford, 1988; Grossman & Salas, 2011). Thus, one proposal that addresses both of these critical elements (i.e., conducting a training needs analysis and boosting training transfer effects) comes from Machin (2002), who suggested utilizing a Transfer of Training Needs Analysis (TTNA; Hesketh, 1997). A TTNA focuses on the pre- and post-training work environment and potential barriers that may interfere with the transfer process. The goal of a TTNA is to make a decision to: a) Move forward with training because no transfer barriers exist, b) remove any potential transfer barriers before proceeding with training, or c) abandon training due to a low likelihood of transfer success (Machin, 2002). Future researchers should study the TTNA process to better

understand what it looks like, how it works, and evidence for its effectiveness. Such research can have implications for both academicians (contributing to the budding literature on training transfer, beyond the current study) and practitioners (assisting organizations with “making training stick”).

A second area ripe for future research is the assessment of learner-learner interactions within the context of mobile technology-based training programs. To elaborate, today there is an understanding that teams are critical for organizational effectiveness (e.g., Kozlowski & Bell, 2003), yet there is still much to learn about learning and training within a group environment (Kraiger & Culbertson, 2012). In a seminal piece on third-generation learning, Kraiger (2008) discussed the role of social interactions within training, arguing that “all learning and understanding are inherently social” (p. 460). This social constructivist approach to learning is not a new concept, with students working in ‘study groups’ to acquire knowledge before exams, and training facilitators utilizing small groups to foster deep discussion of training content. Theoretically, researchers have highlighted the importance of social interactions in fostering individual learning and development (see Garrison, 1993 and Whitelock, Romano, Jelfs, & Brna, 2002 for some examples). Moreover, Kraiger (2008) advised that an online environment may be even more conducive to social learning (than a traditional face-to-face context) due to minimal instructor presence (i.e., learners rely more on each other), numerous available communication methods (i.e., learners can communicate via threaded discussions, video conferencing, document sharing, etc.), and enhanced motivation to engage in learning (i.e., with greater anonymity, learners may feel more confident to participate). Consequently, there is a clear need for more empirical research on the effectiveness of learner-learner interactions (within in-tact teams, ad hoc teams, etc.) in a technology-enabled environment. Given the rising popularity of mobile

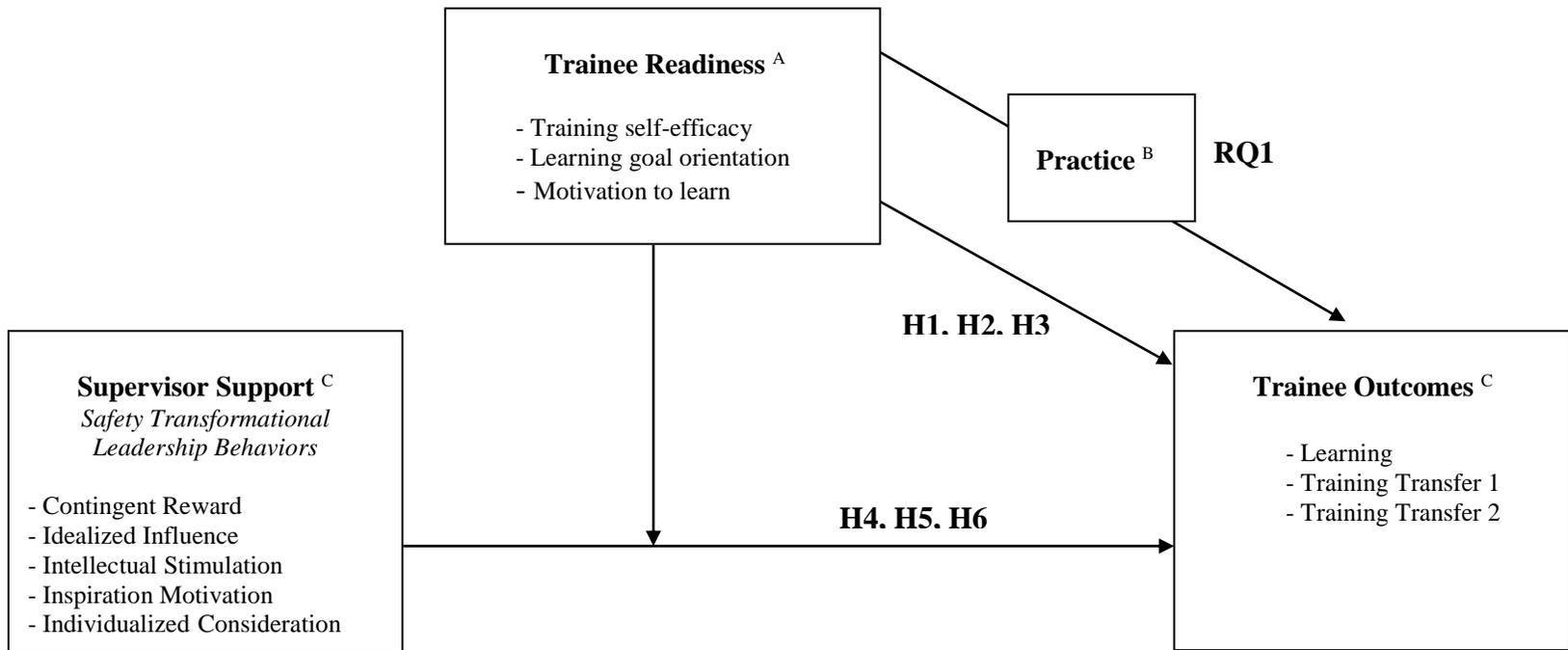
learning tools in the workplace (e.g., Sharples et al., 2009), an emerging research area involves a deep investigation of group variables influencing learning and development in mobile technology-based training programs.

## **Summary**

In summary, the current findings extend existing training research by investigating accelerators of transfer in a mobile technology-based training program. Specifically, I found strong relationships between three indicators of readiness (training self-efficacy, learning goal orientation, motivation to learn) and trainee success post-training. These findings provide organizations with some specific suggestions for boosting training transfer effects: enhance trainees' level of readiness before entering training, and/or select individuals into training who are most ready to learn and develop. Next, I also found significant relationships between safety transformational leadership behaviors and training effectiveness such that trainees benefitted more from training when they perceived that their supervisors engaged in the following safety-related leadership behaviors: Contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration. Further, relative importance analyses highlighted that contingent reward and individualized consideration behaviors exhibited the strongest relationships with post-training outcomes. These findings provide valuable information for organizations trying to create a work environment that supports safety training: reward safety-related achievement (contingent reward) and spend time listening to and supporting trainees' needs (individualized consideration).

In conclusion, identifying strategies for “making training stick” are critical for today's companies who spend billions of dollars on employee learning and development annually (Green & McGill, 2011), yet often fail to see a positive return on their investment (e.g., Saks &

Belcourt, 2006). As highlighted in this research, one approach for mitigating the ‘transfer problem’ is identifying key characteristics that foster training success before, during, and after training. Thus, my study suggests that companies will get the most out of their training investment if they focus their efforts on developing employee readiness for learning, creating a supportive work environment, and designing programs that leverage best practices in training design.



*Note.* Training Transfer 1 = Training Transfer Behavior Scale; Training Transfer 2 = Training Transfer Applied Index Scale; <sup>A</sup> = Questions answered pre-training (time 1); <sup>B</sup> = Questions answered during training (time 2); <sup>C</sup> = Questions answered post-training (time 3).

Figure 1: Proposed model of the effects of trainee readiness, supervisor support, and practice on trainee outcomes

### Pre-training Goals & Strategies

Goals:

1. Improve trainees' motivation to learn,
2. Improve trainees' pre-training self-efficacy/ knowledge, and
3. Demonstrate organizational support for training.

Strategies:

1. Use of goal setting,
2. Allow trainees to participate in decision-making,
3. Provide information concerning the purpose and intended outcomes of training,
4. Reduce any perceived threat to the trainee,
5. Help the trainee to develop better learning strategies,
6. Develop a plan for how the trainee will utilise their training,
7. Identify external factors that may restrict the trainee's ability to utilise their training, and
8. Assist the trainee to identify organisationally valuable outcomes from training.

### Within-training Goals & Strategies

Goals:

1. Improve trainees' understanding and adaptive expertise,
2. Improve trainees' intentions to transfer, and
3. Improve trainees' reactions to training.

Strategies:

1. Use procedures in training are similar to those used in the work place,
2. Use real-life problems that the trainee is familiar with,
3. Provide different examples during training and highlight the important features of each example,
4. Assist trainees to develop detailed, well-integrated knowledge structures, and self-regulatory skills such as planning, monitoring, and evaluation,
5. Set short-term goals for the immediate transfer of their training,
6. Set longer-term goals that focus on the mastery of the training,
7. Assist trainees to develop and commit to specific implementation plans,
8. Use Relapse Prevention as a tool to identify specific situations where they may be at risk of failing to utilise their training, and
9. Create a positive training climate.

### Post-training Goals & Strategies

Goals:

1. Improve the climate for the transfer of training, and
2. Improve the vertical transfer of training.

Strategies:

1. Provide trainees with specific goals for improved performance resulting from transfer of training,
2. Ensure supervisors and co-workers are supportive of the trainees' attempts to transfer their training,
3. Ensure trainees have access to equipment or resources that are essential to the transfer of their training,
4. Positively reinforce better performance,
5. Reduce barriers such as lack of time or opportunity to perform the tasks trainees learned during their training,
6. Train all members of a work unit at the same time,
7. Monitor post-training performance, and
8. Align training with organisational goals and directions.

Figure 2: Summary of the pre-, within-, and post-training goals and strategies from Machin (2002)

Table 1

*Means, standard deviations, and zero-order correlations for all study variables*

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. MTL	4.10	.53	(.90)											
2. LGO	6.49	.60	.52**	(.90)										
3. TSE	6.22	.84	.66**	.74**	(.95)									
4. Practice	3.46	.65	.39**	.40**	.43**	(---)								
5. Learning	3.80	.67	.45**	.29**	.44**	.54**	(.94)							
6. Transfer 1	5.00	1.40	.46**	.32**	.45**	.48**	.82**	(.95)						
7. Transfer 2	5.04	2.94	.21**	.26**	.28**	.47**	.43**	.49**	(---)					
8. STL-CR	3.39	1.20	.41**	.19**	.26**	.33**	.36**	.38**	.30**	(.84)				
9. STL-IM	3.76	1.16	.33**	.17*	.22**	.21**	.27**	.31**	.20**	.74**	(.93)			
10. STL-IS	3.47	1.15	.34**	.23**	.24**	.28**	.30**	.35**	.24**	.80**	.83**	(.86)		
11. STL-II	3.71	1.12	.37**	.25**	.27**	.33**	.32**	.39**	.27**	.75**	.84**	.83**	(.89)	
12. STL-IC	3.58	1.11	.36**	.21**	.26**	.28**	.37**	.40**	.22**	.75**	.72**	.85**	.85**	(.70)

*Note.*  $N = 201$ . MTL, motivation to learn; LGO, learning goal orientation; TSE, training self-efficacy; Transfer 1, training transfer behavior scale; Transfer 2, training transfer applied index; STL-CR, contingent reward safety transformational leadership subscale; STL-IM, inspiration motivation safety transformational leadership subscale; STL-IS, intellectual stimulation safety transformational

leadership subscale; STL-II, idealized influence safety transformational leadership subscale; STL-IC, individualized consideration safety transformational leadership subscale.

\* $p < .05$ . \*\*  $p < .01$ . Numbers in the parentheses along the diagonal are reliability estimates (coefficient alphas).

Table 2

*Hierarchical regression analyses of training self-efficacy on learning and transfer*

Variable	Step 1			Step 2			
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	$\Delta R^2$
Model 1:							
Org	.17	.11	.12	.01	.10	.92	
Training Self-Efficacy <sup>A</sup>				.35	.05	.00**	.18**
Model 2:							
Org	.47	.22	.04*	.14	.21	.50	
Training Self-Efficacy <sup>B</sup>				.73	.11	.00**	.19**
Model 3:							
Org	.61	.48	.20	.20	.47	.68	
Training Self-Efficacy <sup>C</sup>				.95	.25	.00**	.07**

*Note.* <sup>A</sup>, learning regressed on training self-efficacy; <sup>B</sup>, training transfer behaviors (transfer 1) regressed on training self-efficacy; <sup>C</sup>, training transfer applied index (transfer 2) regressed on training self-efficacy.

*B* represents the unstandardized regression coefficient.  $N = 201$ . \* $p < .05$ . \*\*  $p < .01$ .

Table 3

*Hierarchical regression analyses of learning goal orientation on learning and transfer*

Variable	Step 1			Step 2			
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	$\Delta R^2$
Model 1:							
Org	.13	.11	.25	.02	.11	.83	
Learning Goal Orientation <sup>A</sup>				.31	.08	.00**	.08**
Model 2:							
Org	.37	.23	.10	.15	.22	.52	
Learning Goal Orientation <sup>B</sup>				.70	.16	.00**	.09**
Model 3:							
Org	.67	.49	.17	.30	.49	.54	
Learning Goal Orientation <sup>C</sup>				1.21	.36	.00**	.06**

*Note.* <sup>A</sup>, learning regressed on learning goal orientation; <sup>B</sup>, training transfer behaviors (transfer 1) regressed on learning goal orientation; <sup>C</sup>, training transfer applied index (transfer 2) regressed on learning goal orientation.

*B* represents the unstandardized regression coefficient.  $N = 201$ . \* $p < .05$ . \*\*  $p < .01$ .

Table 4

*Hierarchical regression analyses of motivation to learn on learning and transfer*

Variable	Step 1			Step 2			
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	$\Delta R^2$
Model 1:							
Org	.18	.11	.10	-.01	.10	.95	
Motivation to Learn <sup>A</sup>				.57	.08	.00**	.19**
Model 2:							
Org	.48	.22	.03*	.11	.21	.62	
Motivation to Learn <sup>B</sup>				1.18	.17	.00**	.19**
Model 3:							
Org	.64	.48	.19	.31	.49	.53	
Motivation to Learn <sup>C</sup>				1.07	.41	.01*	.04*

*Note.* <sup>A</sup>, learning regressed on motivation to learn; <sup>B</sup>, training transfer behaviors (transfer 1) regressed on motivation to learn; <sup>C</sup>, training transfer applied index (transfer 2) regressed on motivation to learn.

*B* represents the unstandardized regression coefficient.  $N = 201$ . \* $p < .05$ . \*\*  $p < .01$ .

Table 5

*Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting learning*

Variables	$C_J$	% $R^2$
DV = learning ( $R^2 = .22$ )		
Training Self-Efficacy	.10	45.45
Learning Goal Orientation	.02	6.82
Motivation to Learn	.11	47.73

*Note.*  $N = 201$ .  $C_J$  = general dominance weights.

Table 6

*Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting training transfer 1*

Variables	$C_J$	% $R^2$
DV = training transfer 1 ( $R^2 = .23$ )		
Training Self-Efficacy	.11	45.65
Learning Goal Orientation	.02	8.70
Motivation to Learn	.11	45.65

*Note.* Training Transfer 1 = Training Transfer Behavior Scale.

$N = 201$ .  $C_J$  = general dominance weights.

Table 7

*Results of relative importance analyses for training self-efficacy, learning goal orientation, and motivation to learn in predicting training transfer 2*

Variables	$C_J$	% $R^2$
DV = training transfer 2 ( $R^2 = .11$ )		
Training Self-Efficacy	.05	43.94
Learning Goal Orientation	.04	39.39
Motivation to Learn	.02	16.67

*Note.* Training Transfer 2 = Training Transfer Applied Index Scale.

$N = 201$ .  $C_J$  = general dominance weights.

Table 8

*Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on learning*

Variable	Step 1			Step 2			$\Delta R^2$
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	
Model 1: Org	.17	.11	.12	.02	.11	.89	
Contingent Reward				.20	.04	.00**	.12**
Model 2: Org	.17	.11	.12	.08	.11	.48	
Inspiration Motivation				.15	.04	.00**	.06**
Model 3: Org	.17	.11	.12	.05	.11	.68	
Intellectual Stimulation				.17	.04	.00**	.08**
Model 4: Org	.17	.11	.12	.03	.11	.78	
Idealized Influence				.19	.04	.00**	.09**
Model 5: Org	.18	.11	.10	.00	.11	.99	
Individualized Consideration				.22	.04	.00**	.12**

*Note.* *B* represents the unstandardized regression coefficient.  $N = 201$ . \* $p < .05$ . \*\*  $p < .01$ .

Table 9

*Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on training transfer 1*

Variable	Step 1			Step 2			$\Delta R^2$
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	
Model 1: Org	.47	.22	.04*	.13	.22	.56	
Contingent Reward				.43	.08	.00**	.13**
Model 2: Org	.47	.22	.04*	.25	.22	.26	
Inspiration Motivation				.36	.08	.00**	.08**
Model 3: Org	.47	.22	.04*	.15	.22	.49	
Intellectual Stimulation				.41	.09	.00**	.10**
Model 4: Org	.47	.22	.04*	.12	.22	.58	
Idealized Influence				.47	.09	.00**	.13**
Model 5: Org	.48	.22	.03*	.07	.22	.75	
Individualized Consideration				.50	.09	.00**	.14**

*Note.* Training Transfer 1 = Training Transfer Behavior Scale. *B* represents the unstandardized regression coefficient.

*N* = 201. \**p* < .05. \*\* *p* < .01.

Table 10

*Hierarchical regression analyses of contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration on training transfer 2*

Variable	Step 1			Step 2			$\Delta R^2$
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	
Model 1: Org	.61	.48	.20	.07	.48	.88	
Contingent Reward				.71	.18	.00**	.08**
Model 2: Org	.61	.48	.20	.33	.48	.50	
Inspiration Motivation				.47	.18	.01*	.03*
Model 3: Org	.61	.48	.20	.17	.49	.73	
Intellectual Stimulation				.60	.19	.00**	.05**
Model 4: Org	.61	.48	.20	.12	.48	.81	
Idealized Influence				.69	.19	.00**	.06**
Model 5: Org	.64	.48	.19	.20	.50	.69	
Individualized Consideration				.55	.20	.01*	.04*

*Note.* Training Transfer 2 = Training Transfer Applied Index Scale. *B* represents the unstandardized regression coefficient.

*N* = 201. \**p* < .05. \*\* *p* < .01.

Table 11

*Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting learning*

Variables	$C_J$	% $R^2$
DV = learning ( $R^2 = .16$ )		
Contingent Reward	.05	30.10
Inspiration Motivation	.01	8.75
Intellectual Stimulation	.02	15.52
Idealized Influence	.02	15.52
Individualized Consideration	.05	30.10

*Note.*  $N = 201$ .  $C_J$  = general dominance weights.

Table 12

*Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting training transfer 1*

Variables	$C_J$	% $R^2$
DV = training transfer 1 ( $R^2 = .18$ )		
Contingent Reward	.04	24.81
Inspiration Motivation	.02	11.39
Intellectual Stimulation	.03	14.17
Idealized Influence	.04	22.04
Individualized Consideration	.05	27.59

*Note.* Training Transfer 1 = Training Transfer Behavior Scale.

$N = 201$ .  $C_J$  = general dominance weights.

Table 13

*Results of relative importance analyses for contingent reward, inspiration motivation, intellectual stimulation, idealized influence, and individualized consideration in predicting training transfer 2*

Variables	$C_J$	% $R^2$
DV = training transfer 2 ( $R^2 = .11$ )		
Contingent Reward	.04	38.48
Inspiration Motivation	.01	11.97
Intellectual Stimulation	.01	13.48
Idealized Influence	.03	24.09
Individualized Consideration	.01	11.97

*Note.* Training Transfer 2 = Training Transfer Applied Index Scale.

$N = 201$ .  $C_J$  = general dominance weights.

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## APPENDIX

Please think about your own learning and development. Use the rating scales below to indicate the degree to which you agree or disagree with the following statements:

### ***Motivation to Learn (adapted from Noe & Schmitt, 1986)***

Rating Scale: 1 (Strongly Disagree), 3 (Neither Agree nor Disagree), 5 (Strongly Agree)

1. I am motivated to learn the concepts that will be covered in this training program.
2. I will try to learn as much as I can from this training program.
3. I want to increase my understanding of the material that this training program covers.
4. If I can't understand some part of the training program, I will try harder.
5. I intend to learn the concepts in this training program.
6. I am genuinely interested in the content of this training program.

### ***Learning Goal Orientation (adapted from Grant & Dweck, 2003)***

Rating Scale: 1 (Strongly Disagree), 3 (Slightly Disagree), 5 (Slightly Agree), 7 (Strongly Agree)

1. I strive to constantly learn and improve at work.
2. At work I am always seeking opportunities to develop new skills and acquire new knowledge.
3. At work I focus on developing my abilities and acquiring new ones.
4. I enjoy challenging and difficult tasks at work where I'll learn new skills.

### ***Training Self-Efficacy (adapted from Guthrie & Schwoerer, 1994)***

Rating Scale: 1 (Strongly Disagree), 3 (Slightly Disagree), 5 (Slightly Agree), 7 (Strongly Agree)

1. I am confident that I can succeed in this training program.
2. I believe I will do well in this training program.
3. I will be able to learn information and skills in this training program.
4. I will be able to apply skills from this training program.
5. I will be able to apply what I have learned in this training program.
6. I am confident that this training program will help me perform my job better.

***Practice (made up by the author for the current study)***

Rating Scale: 1 (Never), 3 (Occasionally), 5 (Very Frequently)

1. Think back to the commitments you have made in earlier modules. To what extent have you practiced any goal-related skills and behaviors?

Think about your current learning attitudes and behaviors. Use the rating scales below to indicate the degree to which you agree or disagree with the following statements:

***Self-Reported Learning (made up by the author for the current study)***

Rating Scale: 1 (Strongly Disagree), 3 (Neither Agree nor Disagree), 5 (Strongly Agree)

1. I learned new ways to think about my safety in this training program.
2. After going through this training program, I now think differently about safety in the workplace.
3. After going through this training program, I now see how safety and production go hand-in-hand.

4. After going through this training program, I now place a higher value on safety at work.
5. After going through this training program, I now understand how my safety attitudes and behaviors are linked.

***Training Transfer Behaviors (adapted from Machin & Fogarty, 2004 and Al-Eisa et al., 2009)***

Rating Scale: 1 (Strongly Disagree), 3 (Disagree a Little), 5 (Agree a Little), 7 (Strongly Agree)

1. I have discussed with my supervisor ways to apply the material that I have learned in this training program.
2. I have discussed with my co-workers ways to apply the material that I have learned in this training program.
3. I have used the knowledge and skills I learned in this training program on the job.
4. The knowledge and skills I learned in this training program are useful to me in my current role.
5. The knowledge and skills I learned in this training program have helped me improve my job performance.

***Training Transfer Applied Index (made up by the author for the current study)***

1. Select which concepts you have applied or put into action in some way at home or at work (*highest possible score=8*):
  - a. Reasons to Care, Safety Culture, DVR, Gorillas/Blind Spots, Magic 7, Multi-tasking/Magic 7 Overload, Playlists, Frames
2. Select which concepts you have applied or put into action in some way at home or at

work (*highest possible score=7*):

- a. Fighting Complacency/Autopilot, Recognizing Small or Gradual Change, Internal vs. External Control, Know vs. Go Systems, Health vs. Unhealthy Stress Responses, Active Caring, Can I Look Myself in the Mirror?

Think about the current leadership in your organization as you answer the following questions.

***Safety Transformational Leadership (adapted from Barling et al., 2002)***

Rating Scale: 1 (Not at all), 3 (Sometimes), 5 (Frequently or Always)

1. My supervisor expresses satisfaction when I perform my job safely (*Contingent Reward*).
2. My supervisor makes sure that we receive appropriate recognition for achieving safety targets on the job (*Contingent Reward*).
3. My supervisor provides continuous encouragement to do our jobs safely (*Inspiration Motivation*).
4. My supervisor shows determination to maintain a safe work environment (*Inspiration Motivation*).
5. My supervisor suggests new ways of doing our jobs more safely (*Intellectual Stimulation*).
6. My supervisor encourages me to express my ideas and opinion about safety at work (*Intellectual Stimulation*).
7. My supervisor talks about his values and beliefs of the importance of safety (*Idealized Influence*).
8. My supervisor behaves in a way that displays a commitment to a safe workplace (*Idealized Influence*).

9. My supervisor spends time showing me the safest way to do things at work  
*(Individualized Consideration)*.
10. My supervisor would listen to my concerns about safety on the job *(Individualized Consideration)*.