The Effect of Training Self-Efficacy on Computer-Based Training Outcomes: Empirical Analysis of the Construct and Creation of Two Scales

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Authors have shown a strong interest in training self-efficacy (TSE), but two noteworthy concerns are present in the literature. First, existing measures of TSE may contain items that do not gauge their construct of interest. Second, although other forms of self-efficacy may better explain observed relationships, TSE is often studied in isolation. We address these concerns by creating two measures in a four-study process. These measures are shown to have satisfactory psychometric properties and convergent validity. Additionally, we provide an empirical study that investigates, regarding a computer-based training program, the impact of TSE beyond positive self-evaluations, general self-efficacy, and computer-self efficacy. The results demonstrate that TSE is predictive of trainee reactions beyond these other predictors, but it is not predictive of learning. While the specificity of TSE may cause these results, novel theoretical perspectives may better explain the observed relationships.

Self-efficacy is among the most popular constructs in the fields of business and psychology (Bandura, 2012, 2015; Beck & Schmidt, 2015; Yeo & Neal, 2013). Researchers have continuously sought personal and environmental factors that cause employees to develop or diminish their self-efficacy, and the construct has been shown to predict a vast amount of beneficial organizational outcomes, further spurring its continued study (Bandura & Locke, 2003; Judge & Bono, 2001; Luthans & Peterson, 2002; Stajkovic & Luthans, 1998). Although the study of self-efficacy has improved our understanding of employees and the workplace, an even deeper understanding may be achieved by analyzing specific forms of self-efficacy.

Training self-efficacy (TSE) is the belief in one's ability to succeed in developmental workplace programs (Carter & Beier, 2010; Chiaburu & Lindsay, 2008; Chiaburu et al., 2010; Guthrie & Schwoerer, 1994, 1996). Training self-efficacy is often believed to be related to trainee reactions, learning, and transfer of training, and each of these outcomes further relates to employee productivity and organizational success (Al-Eisa et al., 2009; Chiaburu & Lindsay, 2008; Tannenbaum et al., 1991). While extant research has provided many noteworthy inferences about the construct, we argue that two factors hamper our understanding of TSE.

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First, existing measures of TSE have certain concerns that occur with consistency and regularity. Many measures of TSE contain items that may not gauge their construct of interest (e.g., "I feel confident that my skills and abilities equal or exceed those of my colleagues" (Noe & Wilk, 1993) and "I am sure I can overcome obstacles on the job that hinder my use of new knowledge and skills" (Guthrie & Schwoerer, 1994)). Inferences derived from these measures may not entirely reflect TSE. Likewise, few authors have provided suitable psychometric and validity information for these measures, drawing further concerns regarding their repeated use. Second, few studies have investigated TSE concurrently with other forms of self-efficacy. Authors most often study TSE alone, although general self-efficacy or other specific forms of self-efficacy may more strongly predict outcomes. Still, these other forms of self-efficacy may better explain relationships that are ascribed to TSE, and studying TSE alone may provide inaccurate depictions of the construct. For instance, in the case of computer-based training (CBT), TSE may predict outcomes when analyzed alone; however, such relationships may disappear when accounting for computer self-efficacy. Therefore, current research on TSE may be hampered by methodological and theoretical concerns regarding prior scales and study designs.

This article addresses these concerns. By applying supported scale development procedures (Costello & Osborne, 2005; Hinkin, 1995, 1998; Howard & Melloy, 2015), we create two psychometrically sound and valid measures of TSE: the TSE Scale (TSES; 11-item) and the TSES-Short (4-item). These measures avoid the concerns of prior measures, and they open avenues for future research. In addition, we present an empirical study that, in the context of CBT, analyzes the effect of TSE in conjunction with positive self-evaluations, general self-efficacy, and computer self-efficacy. Several authors have argued that CBT programs represent the future of organizational training programs, because they are often cheaper and more effective than comparable alternatives (Ford, 2014; Salas et al., 2009; Sung & Choi, 2014). By analyzing TSE, general self-efficacy, and computer self-efficacy together in this context, the empirical study provides important insights into their combined role in the most popular—and possibly most important—training method (Bell & Kozlowski, 2008; Ford, 2014; Salas et al., 2009). More pertinent to the current article, the study provides a robust investigation into the true effects of TSE.

To achieve these goals, the text is organized in the following manner. First, a review of existing TSE measures is provided, with a particular focus on their theoretical and psychometric concerns. Second, a 4-study scale-development procedure is performed, creating psychometrically sound and valid measures of TSE. Third, a theoretical argument is presented about the effects of TSE, computer self-efficacy, and general self-efficacy during a CBT, which results in several testable hypotheses. Fourth, an empirical study tests the hypotheses. Fifth, the results are integrated into extant literature, and implications and future directions are discussed.

Background

Bandura (1969, 1977, 1982, 1986, 1994, 2012, 2015) popularized the construct of self-efficacy in modern research, which he defined as, "People's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 71). Many theories and explanatory mechanisms have been proposed to understand the link between self-efficacy and beneficial outcomes, but among the most supported is influence of self-efficacy on goal setting and striving (Bandura, 1994, 2012, 2015; Schwarzer, 2014; Zimmerman, 2000; Zimmerman et al., 1992). In general, those higher in self-efficacy are more likely to set higher goals and be persistent compared to those with lower self-efficacy (Brusso et al., 2012; Locke & Latham, 2013; Schunk & Zimmerman, 2012).

Because multiple goals can be held simultaneously, people may also have differing self-efficacy regarding the domain in which these goals arise (Bandura, 2012, 2015; Bong & Skaalvik, 2003; Gist, 1987). For instance, job self-efficacy refers to perceived capabilities to achieve job-related goals, and it is separate from general self-efficacy (Lubbers et al., 2005; Scaubroeck & Merritt, 1997). These specific forms of self-efficacy predict outcomes that are relevant to their domain more strongly than general self-efficacy (Agarwal et al., 2000; Hsu & Chiu, 2004), suggesting that specific forms of self-efficacy are more proximal to goal setting, striving, and achievement. In the context of training, TSE is among the most relevant specific forms of self-efficacy (Carter & Beier, 2010; Chiaburu et al., 2010; Guthrie & Schwoerer, 1996).

When they undergo a training program, trainees are expected to effectively learn and transfer their newfound behaviors to the workplace (Chiaburu & Lindsay, 2008; Al-Eisa et al., 2009; Salas et al., 2012; Tannenbaum et al., 1991). They are also expected to set these expectations as personal goals. If a trainee has low TSE, then he or she may set lower personal goals and be less persistent in pursuing these goals. For instance, trainees may intend to learn only a portion of the training material if they perceive themselves as being unable to succeed in training tasks, which would be an instance of lower goal setting as a result of lower self-efficacy.

Further, other specific forms of TSE may be predictive of certain training outcomes. In the foregoing example, learning self-efficacy may also influence goal setting and striving for learning tasks during a training program (Dierdoff et al., 2010; Lin et al., 2013; Potosky & Ramakrishna, 2002). While the two constructs may overlap, this specific form of self-efficacy differs from TSE due to its increased specificity. Also due to its increased specificity, learning self-efficacy may strongly relate to certain training outcomes (i.e., learning) but be unrelated to many other such outcomes (i.e., reactions). This is often referred to as the bandwidth–fidelity dilemma, in which narrow constructs better predict specific outcomes but general constructs predict many outcomes (Hogan & Roberts, 1996; Ones & Viswesvaran, 1996). Our contention, which we believe

the current literature reflects (Carlson et al., 2000; Carter & Beier, 2010; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Chiaburu et al., 2010; Guthrie & Schwoerer, 1994, 1996), is that TSE strikes a suitable middle ground in the bandwidth–fidelity dilemma. It may predict most training outcomes rather than a limited few.

Together, because of its proximal nature to the training process, it is important to identify the influence of TSE on the trainee to fully understand employee development and subsequent organizational success. To do so, however, an adequate measure of TSE must be identified, or—if one cannot be clearly identified—an adequate measure of TSE must be created.

Prior Measures of Training Self-Efficacy

No standard measure for TSE currently exists. Perhaps the most popular measure is the 13-item scale created by Noe and Wilk (1993). This scale has been used in several subsequent studies (Carlson et al., 2000; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Chiaburu et al., 2010), and it demonstrates an acceptable Cronbach's alpha (~.80). Some authors have claimed that the scale "was validated" (Chiaburu & Marinova, 2005, p. 115), but a literature review did not uncover any studies that performed a traditional investigation into the validity of Noe and Wilk's (1993) scale. Despite widespread application, the measure has certain concerns.

Of most importance, Noe and Wilk's (1993) scale was not created to gauge TSE, and the original authors did not conceptualize it as such. Instead, their measure was created to gauge general self-efficacy, and Noe and Wilk (1993) used the measure to analyze the relation of general self-efficacy to participation in developmental activities. Describing their scale, Noe and Wilk (1993) disclose that, "Ten of these items were from the general self-efficacy scale developed by Pond and Hay (1989)" (p. 294), and an example scale item is, "My job is within the scope of my abilities." Further, when analyzing the content of the entire scale, only three of the thirteen items appear to directly gauge training-self efficacy. Thus, a primary concern with Noe and Wilk's (1993) scale is construct contamination when applied to gauge TSE.

This is not to say that prior studies applying Noe and Wilk's (1993) measure to gauge TSE lack value (Carlson et al., 2000; Chiaburu & Lindsay, 2008; Chiaburu et al., 2010). Indeed, these studies have provided important insights into the relation of the construct with training attitudes, cognitions, motivation, and even transfer (Carlson et al., 2000; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Chiaburu et al., 2010). These noted concerns do, however, raise questions about the accuracy of these studies. While general self-efficacy and TSE may have similar effects, it is not guaranteed that they are identical. Likewise, it is not guaranteed that a general self-efficacy scale with TSE items provides

identical results to a scale that gauges TSE alone. For these reasons, it is important to look beyond Noe and Wilk's (1993) scale.

Other authors have created TSE scales that have been used in few, if any, additional studies beyond their initial application (Brown & Warren, 2009; Carter & Beier, 2010; Guthrie & Schwoerer, 1994, 1996; Tziner et al., 2007). Although these scales may be satisfactory, very little is known about their psychometric properties or validity, and authors cannot be certain about the integrity of their results from using the scales. Also, the modest use of these scales insinuates that other researchers may likewise perceive such concerns, thereby choosing not to apply the scales in their own research. We do not discuss these scales in depth within the current article, but these scales may not pose any psychometric or validity concerns. For this reason, we include items from these scales when undergoing the scale-development process detailed in the following text, with the intention of retaining satisfactory items while removing any concerning items. Likewise, we analyze the relationship of our newly created scale alongside Guthrie and Schwoerer's (1994) measure, as it is among the most used of these alternative TSE measures (Al-Esia et al., 2009; Guthrie & Schwoerer, 1996; Schwoerer et al., 2005).

It should also be noted that many authors have applied measures of pre-training self-efficacy and post-training self-efficacy. Typically, these are measures of general or job self-efficacy applied either before or after a training program, and they are conceptually distinct from training self-efficacy. Therefore, these scales are not discussed.

Together, it appears that no entirely satisfactory measure of TSE exists, or, at least, no measure has been empirically supported through traditional approaches. Because TSE is important for employee development and organizational success, we present a 4-study process to create two psychometrically sound and valid scales of TSE: the TSES and the TSES-Short. These scales overcome the shortcomings of prior measures. Particularly, selected items are taken or modified from prior scales to ensure that each item gauges TSE, and the scale-development process, detailed subsequently, ensures that each item gauges a common construct. This process also ensures that the scales produce proper validity information, which has yet to be firmly supported with prior measures. By supporting the psychometric properties and validity of these measures, the current article produces a measure that avoids many of the concerns of these prior measures.

Because TSE is important for employee development and organizational success, we present a four-study process to create two psychometrically sound and valid scales of TSE: the TSES and the TSES-Short.

Scale Development

Prior guides for the scale-development process were applied in the creation of the two measures of TSE (Costello & Osborne, 2005; Hinkin 1995, 1998; Howard, 2016, 2018; Howard & Melloy, 2015). We

most closely followed the suggestions of Hinkin (1995, 1998), which are likely the most commonly applied guides in organizational research for the overall scale-development process. More nuanced guides were also followed for each specific step of the scale-development process. For instance, Anderson and Gerbing (1991), Howard and Melloy (2015), and Howard (2018) present many best practices for item-sort tasks, which represent the first step of Hinkin's (1995, 1998) scale-development process. Many of these best practices were only briefly mentioned in Hinkin (1995, 1998), and therefore supplementing these guides for the overall scale development process can help ensure the creation of adequate scales.

The following steps are taken in the current article: item-sort task (Study 1), which creates the TSES; exploratory factor analysis (EFA; Study 2), which creates the TSES-Short and explores the psychometric properties of the TSES and TSES-Short; confirmatory-factor analysis (CFA; Study 3), which confirms the factor structure of the TSES and TSES-Short; and convergent-validity check (Study 4), which analyzes the relationships of the TSES and TSES-Short with measures of training and general self-efficacy. Thereafter, the TSES and TSES-Short are applied in an empirical study to understand the effects of TSE during a CBT (Study 5).

Study 1—Item-Sort Task

To begin the scale-creation process, an over-representative item list was created and subsequently reduced. Several authors have suggested that creating and reducing an over-representative item list ensures the content validity of a created scale, allowing all facets of a construct to be measured (Anderson & Gerbing, 1991; Hinkin 1995, 1998; Howard & Melloy, 2015). In Study 1, the item list contained 40 items. Each item was adapted from a prior TSE scale and modified for clarity or a prior general self-efficacy scale and modified to gauge TSE, resulting in items that gauge a general and unidimensional conceptualization of TSE. To reduce the item list and remove items that may not gauge TSE, an item-sort task was performed. Item-sort tasks have been shown to identify interrelated items with comparable precision to an EFA, but using only a fraction of the sample size. In cases that the sample-size requirements may be considerably large for an EFA (i.e., many items), item-sort tasks are ideal.

Method

Participants.

Study 1 included 20 participants ($M_{age} = 32.60$, $SD_{age} = 11.01$; 30% female; 80% Caucasian) recruited from mTurk in return for a small amount of monetary compensation. This website, mTurk, connects individuals willing to perform tasks on their computer, such as taking a survey, with those who need the tasks performed. Previous studies have shown results

using mTurk as valid (Buhrmester et al., 2011; Paolacci & Chandler, 2014; Shapiro et al., 2013). In addition, three attention checks were used in Study 1. All 20 participants passed the three attention checks, indicating that they provided sufficient attention throughout the study.

Procedure.

Participants signed-up for the study via the website mTurk. Participants were given a comprehensive definition of TSE, and were told to indicate, for each of the 40 created items, whether they believed that the item gauged TSE or any other construct using a 2-option rating scale. The two opinions were "Training Self-Efficacy" and "Something Else," which has been suggested by prior authors (Anderson & Gerbing, 1991; Howard & Melloy, 2015).

Results and Discussion

In the performance of an item-sort task, items consistently assigned to their corresponding construct display high levels of substantive validity, which is indicative of the resultant scale's construct validity (Anderson & Gerbing, 1991; Howard & Melloy, 2015). The proportion of substantive agreement (p_{SA}) and the coefficient of substantive validity (c_{SV}) were used to calculate the statistical significance of each item, indicating (in)sufficient substantive validity and thereby determining whether an item should be retained or discarded. p_{SA} refers to the proportion of respondents that indicated an item measures its intended construct more so than any other construct, and c_{SV} is the extent to which respondents indicate an item measures its intended construct more so than all other constructs (Anderson & Gerbing, 1991; Howard & Melloy, 2015). For the current study, at least 15 participants must have responded that an item gauged TSE for it to be statistically significant, using both p_{SA} and c_{SV}.

The resultant p_{SA} and c_{SV} values indicated that 15 items were statistically significant whereas 25 items were not statistically significant. Using these results, we removed 25 of the original 40 items, resulting in a 15-item scale. In general, the removed items may have partially gauged TSE, but they also appeared to include aspects of other constructs, such as persistence ("If I can't succeed at a training program the first time, I keep trying until I can"), resourcefulness ("If a training program is difficult, I can find means and ways to get what I want"), and emotional stability ("I can remain calm when facing training program difficulties"). The retained items are henceforth entitled the TSE Scale (TSES).

Further, the TSTS-Short was not created during Study 1 because an EFA is still preferred when sample sizes are obtainable (i.e., few items are included). As the item-sort task identified 15 items that are almost assuredly interrelated, the TSES-Short is created through an EFA in Study 2 using these 15 items. Thus, the TSES-Short is created in the following study.

Study 2—Exploratory Factor Analysis

Any measure should be properly interrelated and have an identifiable factor structure. Also, researchers are sometimes constrained by time and resources, and they may prefer a short measure of TSE. In Study 2, the TSES-Short is created, and the factor structure of both the TSES and TSES-Short are examined via EFA. Both scales are expected to be unidimensional.

Method

Participants.

Study 2 included 199 participants (Mage = 33.64, SDage = 9.32; 39% female; 54% Caucasian) recruited from mTurk in return for a small amount of monetary compensation. Most participants (86%) were currently employed, with most of these having full-time employment (84%). Of those employed, the average length of employment was 6.07 years (SD = 5.74). All statistics, including the sample size reported previously, reflects the sample after removing those that failed any attention checks.

Procedure.

Participants signed up for the study via mTurk and completed all study procedures online.

Measures.

The 15-item TSES created in Study 1 was administered.

Results and Discussion

To identify the factor structure of the TSES, an EFA was conducted. In agreement with previous authors (Hinkin 1995, 1998; Howard, 2016), a principal axis factoring method with a direct oblimin rotation was chosen to perform the EFA, and a visual scree plot analysis and parallel analysis were used to determine the number of emergent factors. The visual analysis of the scree plot indicated that the scale is unidimensional (Eigenvalues = 9.912, .943, .621, …), as the eigenvalues greatly decreased after the first factor and remained consistent afterwards. The parallel analysis also indicated that the TSES contained a single factor (95% Parallel Analysis Eigenvalues = 1.707, 1.549, 1.444, …), as the parallel analysis eigenvalues were less than the EFA eigenvalues for the first factor but greater for all other factors. The first factor accounted for 66 percent of the variance within the items. These results are in agreement with expectations, given that the TSES was created with intentions to be unidimensional.

Further, the factor loading of each item on the one factor was extremely strong (> .60) and well beyond the conventional cutoffs of .35 and .40 (Hinkin, 1998; Howard, 2016). Most items loaded around .80. Cross-loadings were not a concern, as the scale is unidimensional and items

cannot load on other factors. The Cronbach's alpha of the TSES was .95, which is above most standards for internal consistency. The item means ranged from 5.17 to 5.85, and the standard deviations ranged from 1.09 to 1.32. While slightly negatively skewed, the skewness of the items did not exceed +/-1.5. These results initially support the psychometric properties of the TSES, thereby indicating that further analyses are warranted.

Finally, a second scale was created that included only the five TSES items with the greatest factor loadings (.89, .88, .87, .85, .84). This scale is entitled the TSES-Short. Another EFA was performed on the TSES-Short. Once again, the visual analysis (Eigenvalues = 3.987, .330, .280 …) and the parallel analysis (95% Parallel Analysis Eigenvalues = 1.343, 1.181, 1.065 …) indicated that the scale is unidimensional. The factor loading of each item was strong (> .80), and cross-loadings were still not a concern. The Cronbach's alpha of the TSES-Short was .91, above most standards for internal consistency. Finally, the correlation of the TSES and the TSES-Short was extremely high ($r = .96$, $p < .01$). Thus, the psychometric properties of the TSES-Short were also strongly supported, and further analyses are warranted.

Study 3—Confirmatory Factor Analysis

In Study 3, the factor structures of the TSES and TSES-Short are confirmed, which is a necessary step in the scale creation process (Hinkin, 1995, 1998). To do this, a confirmatory factor analysis (CFA) is performed, which is a more conservative analysis than an EFA.

Method

Participants.

Study 3 included 204 participants ($M_{age} = 34.67$, $SD_{age} = 11.36$; 44% female; 74% Caucasian) recruited from mTurk in return for a small amount of monetary compensation. Most participants (86%) were currently employed, with most of these having full-time employment (76%). Of those employed, the average length of employment was 5.25 years ($SD = 5.85$). All statistics, including the sample size reported previously, reflect the sample after removing those that failed any attention checks.

Procedure.

Participants signed up for the study via mTurk and completed all study procedures online.

Measures.

The 15-item TSES was administered ($\alpha = .93$). The five items from the TSES that comprise the TSES-Short were also analyzed separately in the current study ($\alpha = .86$).

Results and Discussion

The suggestions of prior authors were applied to perform the CFA (Brown, 2015; Harrington, 2008; Thompson, 2004). For all analyses, a listwise deletion method was used. Also, for both scales, each item was forced to load onto a single factor, because the scales were found to be unidimensional in Study 2. The initial overall model fit was below expectations for the TSES. The CFI (.88), NFI (.85), RMSEA (.12), and SRMR (.06) largely fell short of their suggested cutoffs for acceptable fit (CFI > .95, NFI > .95, RMSEA < .08, SRMR < .05; Brown, 2015; Harrington, 2008; Thompson, 2004). The chi-square to degrees of freedom ratio was 3.74, which is higher than desired (< 3). The standardized item loadings for the TSES were satisfactory, however. Each item loaded above .50, which is well above suggested cutoffs.

To improve model fit, items were removed in a stepwise manner based on the summated modification indices of their error term. The process was repeated until all modification indices were less than 10, as suggested by prior authors (Brown, 2015; Harrington, 2008; Thompson, 2004). This process resulted in the removal of four items. When the wording of these items was analyzed, it was determined that other remaining items sufficiently gauged their content. The model fit of the revised, 11-item TSES was excellent. The CFI (.99), NFI (.96), RMSEA (.04), and SRMR (.03) all met their cutoff for acceptable fit. The chi-square to degrees of freedom ratio was 1.34, which is well below the suggested value of three. Likewise, the item loadings improved, with each loading above .60 (see Table 1). Together, after problematic items were removed, the psychometric properties of the TSES were exceptional, as indicated by the CFA.

Additionally, a second CFA was performed on the items comprising the TSES-Short. One item was removed from the TSES-Short because it was problematic in the CFA for the preceding TSES, resulting in the

TABLE 1 THE TRAINING SELF-EFFICACY SCALE CONFIRMATORY FACTOR ANALYSIS STANDARDIZED ITEM LOADINGS

ITEM NUMBER	STANDARDIZED ITEM LOADING
1	.66
2	.67
3	.81
4	.79
5	.82
6	.83
7	.82
8	.62
9	.62
10	.82
11	.69

TSES-Short consisting of four items. All model-fit indices immediately met the cutoffs for excellent fit (CFI = 1.00, NFI = 1.00, RMSEA = .00, SRMR = .01, chi-square-to-df ratio = 0.62). In addition, the standardized item loadings were very satisfactory. Each item loaded above .75. Finally, the correlation of the TSES and the TSES-Short was, again, extremely strong ($r = .95$, $p < .05$). Together, these results indicate that the TSES and the TSES-Short have superb psychometric properties that are in agreement with expectations. The finalized 11-item TSES and 4-item TSES-Short are included in Appendix A.

Study 4—Convergent and Discriminant Validity

Any valid measure should be strongly related to other measures of the same or similar constructs, known as convergent validity. Although other TSE scales have their concerns, they likely gauge some aspects of TSE, and the TSES and TSES-Short should be strongly related to these other measures. The TSES and TSES-Short should also be strongly related to measures of general self-efficacy. Lastly, the two measures should be distinct from prior measures of TSE and general self-efficacy, which is known as discriminant validity.

Method

Participants.

Study 4 included 83 participants (Mage = 19.76, SDage = 3.51; 67% female; 80% Caucasian) recruited from an undergraduate-student participant pool of a large university from the Northeastern United States in return for a small amount of course credit. All participants must have been currently employed, with most of them having part-time employment (96%). Of those employed, the average length of employment was 1.48 years (SD = 1.48). All statistics, including the sample size reported previously, reflect the sample after removing those that failed any attention checks.

Procedure.

Participants signed up for the study and completed all study procedures online.

Measures.

The 11-item TSES was administered ($\alpha = .92$). The four items from the TSES that comprise the TSES-Short were also analyzed separately in the current study ($\alpha = .84$).

Training self-efficacy.

Two other TSE measures were administered. The first was Noe and Wilk's (1993) 13-item measure ($\alpha = .87$), and an example item is,

"In general, I am usually a good judge of my capabilities." The second was Guthrie and Schwoerer's (1994) six-item measure (α = .91), and an example item is, "I do well in training."

General self-efficacy.

Chen et al.' (2001) 8-item general self-efficacy measure was administered (α = .94). An example item is, "I am confident that I can perform effectively on many different tasks."

Results and Discussion

Correlations and Cronbach's alphas of all measures are included in Table 2. The TSES showed satisfactory correlations with the other measures of TSE ($r = .75$, $p \leq .01$; $r = .58$, $p \leq .01$), as did the TSES-Short ($r = .76$, $p \leq .01$; $r = .66$, $p \leq .01$). Both measures also demonstrated strong correlations with the measure of general self-efficacy (TSES, $r = .65$, $p \leq .01$; TSES-Short, $r = .70$, $p \leq .01$). Finally, the correlation between the TSES and TSES-Short was, again, extremely strong ($r = .94$, $p \leq .01$). These results show that the TSES was sufficiently related to other measures of TSE and general self-efficacy, which supports the scale's convergent validity.

To gauge the discriminant validity of the TSES and the TSES-Short, an approach created by Henseler et al. (2015) was applied. In this approach, a ratio is created by dividing the average item cross-correlations between two scales by the average item inter-correlations within the two scales. If the ratio is below the cutoff of .90, the discriminant validity of the two scales is supported. Further, this approach is preferred over the popular F-L criterion, as the F-L criterion has been shown to provide erroneous results in several recent simulation studies (Aguirre-Urreta et al., 2013; Henseler et al., 2015; Voorhees et al., 2016).

Henseler et al.'s (2015) approach suggested that the TSES had sufficient discriminant validity with the other two measures of TSE (Ratio = .85; Ratio = .62) as well as general self-efficacy (Ratio = .76). The TSES-Short was also shown to have sufficient discriminant validity with the other two

TABLE 2 CORRELATION OF ALL MEASURED ADMINISTERED IN STUDY 4 (CONVERGENT VALIDITY)[Q

	MEAN	S.D.	1	2	3	4	5
1.) TSES	5.45	.81	.92				
2.) TSES-Short	5.58	.86	.94**	.84			
3.) N&W TSES	5.51	.67	.75**	.76**	.87		
4.) G&S TSES	5.98	.67	.58**	.66**	.75**	.91	
5.) GSE	5.75	.82	.65**	.70**	.71**	.65**	.94

N&W TSES = Noe and Wilk's (1993) training self-efficacy scale
G&S TSES = Guthrie and Schwoerer's (1994) training self-efficacy scale
GSE = Chen, Gully, and Eden's (2001) general self-efficacy scale
*$p < .05$.; **$p < .01$.

measures of TSE (Ratio = .86; Ratio = .70) as well as general self-efficacy (Ratio = .79). It should be noted, however, that the item inter-correlations of Noe and Wilk's (1993) measure were relatively small (average r = .35) as compared with the average item inter-correlations of the TSES (average r = .53), the TSES-Short (average r = .68), Guthrie and Schwoerer's (1994) measure (average r = .66), and Chen's (2001) measure (average r = .68).

Several inferences should be taken from these results. First, the TSES and TSES-Short are sufficiently related to the three other theoretically similar measures, and the convergent validity of the TSES and TSES-Short is supported. Second, the TSES is sufficiently distinct from the three other measures, as seen in the results of Henseler et al.'s (2015) approach to gauging discriminant validity. The discriminant validity of the TSES and TSES-Short is also supported. Third, the item inter-correlations of Noe and Wilk's (1993) measure were smaller than the inter-correlations of the other scales. This suggests that the scale may have concerning psychometric properties, but more research would be needed to firmly support this inference.

Fourth, while distinct, the TSES is also very strongly related to the three other measures. This is typical for measures of the same or similar constructs, especially those related to self-evaluations. For instance, the constructs of core self-evaluations and psychological capital are extremely strongly related (r > .70; Avey et al., 2010), but they have differing relationships to antecedents and outcomes (Luthans et al., 2007; Peterson et al., 2011). We suggest the same for the scales administered in Study 4. Further, Study 4 was meant to be a conservative test of the scales' distinctness. Typical steps were taken to address common-method bias, as we believed that many researchers would likewise administer the scales in a simple survey format; however, further efforts could have been taken to reduce this bias. For this reason, the observed correlations in Study 4 may be considered the upper bound of the relationship between these measures and constructs, a consideration that is further analyzed and discussed in Study 5.

The results of the scale development process suggest that the TSES and the TSES-Short are psychometrically sound measures that are valid for gauging TSE. With these properties of the TSES and the TSES-Short supported, we apply the two scales in an empirical analysis.

Study 5—Empirical Study

TSE is often studied in isolation, although other relevant variables may explain observed relationships. In the context of CBT, Study 5 investigates the impact of TSE on outcomes beyond positive self-evaluations, general self-efficacy, and computer self-efficacy. In the following text, a background of training outcomes is provided, followed by a review of the theoretical importance of TSE, positive self-evaluations, general self-efficacy, and computer self-efficacy.

Background

Researchers have continuously sought situational factors and individual differences that predict trainee reactions, learning, and transfer-of-training (Bell & Kozlowski, 2008; Ford, 2014; Salas et al., 2009; Sung & Choi, 2014). Trainee reactions are subjective evaluations that trainees make about their training experiences (Brown, 2005; Sitzmann et al., 2008). While the construct is typically gauged by asking trainees about their favorability for a training (i.e. Smile Sheets), trainee reactions include several other subjective evaluations, such as perceived learning (i.e., I learned effectively from the training) or perceived training effectiveness (i.e., The training sufficiently developed my abilities). Alternatively, learning is the acquisition of knowledge, whereas knowledge may be declarative information, mental models, or skills and abilities (Salas et al., 2012; Tannenbaum et al., 1991). Lastly, transfer-of-training is the actual application of learned knowledge, skills, and abilities to the workplace (Baldwin & Ford, 1994; Rouiller & Goldstein, 1993). While each is important, a focus is given to trainee reactions and learning when training outcomes are discussed in the current study. These two training outcomes are almost entirely developed before and during the training program, whereas transfer-of-training is also influenced by individual and situational factors after the training (Ford, 2014; Ford & Weissbeim 1997; Salas et al., 2012). Thus, trainee reactions and learning likely reflect the impact of any individual difference or situational factor that notably influences a training itself.

While many factors may predict training outcomes, TSE is believed to be among the strongest predictors (Chiaburu & Lindsay, 2008; Al-Eisa et al., 2009; Tannenbaum et al., 1991). Often, researchers studying TSE apply a common theoretical perspective. Employees higher in TSE are believed to have strong beliefs in their training-related capabilities, set challenging training goals, and are motivated to complete their training goals (Brown & Warren, 2009; Carter & Beier, 2010; Chiaburu & Marinova, 2005; Chiaburu et al., 2010; Guthrie & Schwoerer, 1994, 1996). These proposed relationships between TSE and motivation have already been supported by prior research (Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Chiaburu et al., 2010; Guthrie & Schwoerer, 1996), but the link between TSE and reactions is still largely unknown. We expect the construct to positively predict training trainee reactions when analyzed in isolation, because TSE heightens trainees' drive and excitement about the training program.

> **Hypothesis 1**: Training self-efficacy positively predicts trainee reactions.

Little support has been provided for the link between TSE and learning (Carlson et al., 2000; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005). Very few authors have directly explored this link (Quiñones, 1995), leaving current research unable to draw clear inferences about the

relationship. More generally, some have shown that TSE significantly relates to skill transfer and post-training performance (Carter & Beier, 2010; Chiaburu & Marinova, 2005; Chiaburu et al., 2010), whereas others have found a non-significant relationship (Chiaburu & Lindsay, 2008; Martin, 2002; Quiñones, 1995). In regard to general self-efficacy, mixed support has also been shown for the relationship of the construct to learning (Liem et al., 2008; Pajares & Graham, 1999; Vancouver & Kendall, 2006), with many methodologically sound studies finding a non-significant relationship (Martocchio & Judge, 1997; Vancouver & Kendall, 2006; Zimmerman et al., 1992). Finally, in regard to learning self-efficacy, authors have again shown mixed support for the construct's relation to learning (Bassi et al., 2007; Brown, 2001), but a greater number of studies have found a significant relationship as compared with general self-efficacy (Caprara et al., 2008; Joo et al., 2000; Wang et al., 2008).

From these cumulative findings, we predict that TSE positively relates to learning. Because learning is a primary goal of the training process, we suggest that TSE influences trainees' goal setting and striving towards this important training outcome.

Hypothesis 2: Training self-efficacy positively predicts learning.

While TSE may improve training outcomes through heightened goal setting and striving, the same theoretical perspective can be applied for the relationship between general self-efficacy and training outcomes (Bandura, 2012, 2015; Bandura & Locke, 2003), and a large body of empirical research has even shown that general self-efficacy predicts training motivation and outcomes (Colquitt et al., 2000). Similarly, other authors have performed empirical studies to show that general self-efficacy predicts pre-training motivation, training performance, and transfer-of-training (Gist et al., 1991; Phillips & Gully, 1997; Quiñones, 1995). Thus, general self-efficacy may play a similar, if not identical, role as TSE in predicting training outcomes.

It is important to show that observed results that are attributed to TSE are due to the construct and not to its underlying relationship with general self-efficacy. If the effect of TSE beyond general self-efficacy is not shown, researchers and practitioners cannot be certain that the narrower construct should be studied and applied in favor of the more general construct.

Additionally, we take our analysis of TSE and general self-efficacy a step further. During the past decade there has been a growing abundance of research on positive self-evaluations, particularly core self-evaluation. Core self-evaluation is a relatively stable personality trait represented by four distinct but interrelated constructs: general self-efficacy, self-esteem, emotional stability, and locus of control (Judge & Bono, 2001; Judge et al., 2003, Judge et al., 2005). While many theories have been applied to understand the influence of core self-evaluations on workplace outcomes (Ferris et al., 2012; Wu & Griffin, 2012), some researchers have also approached

the construct in a similar manner to general self-efficacy (Judge, 2009; Judge et al., 2004; Rode et al., 2012). These researchers propose that employees higher in core self-evaluations are motivated, committed to their goals, and resilient to obstacles. Further, core self-evaluations are strongly related to employee motivation and subsequent performance, much like general self-efficacy (Bono & Judge, 2003; Erez & Judge, 2001). When analyzed together, core self-evaluations may explain the relationship between all positive self-perceptions and training outcomes, leaving TSE as relatively unimportant. If this is the case, then researchers and practitioners would have little reason to study and apply the construct of TSE. Together, it is unclear whether TSE still demonstrates a positive predictive relationship with training outcomes when accounting for general self-efficacy and the other aspects of core-self evaluations.

> **Hypothesis 3**: Training self-efficacy positively predicts trainee reactions when accounting for general self-efficacy and other positive self-evaluations.

> **Hypothesis 4**: Training self-efficacy positively predicts learning when accounting for general self-efficacy and other positive self-evaluations.

In addition to TSE, other domain-specific forms of self-efficacy may influence training outcomes, and the relevant domain-specific form of self-efficacy depends on the training program of interest. Recent authors have noted that CBT has become an extremely popular training method, possibly becoming more popular than traditional training programs (Ford, 2014; Salas et al., 2009; Sung & Choi, 2014). When undergoing a CBT, trainees are often expected to complete self-guided training programs via a computer with limited, if any, guidance, from an in-person trainer. Due to the reliance on computers, computer self-efficacy is almost assuredly an important domain-specific form of self-efficacy for training outcomes during a CBT.

Computer self-efficacy is the belief in one's ability to succeed on computer-related tasks and solve difficult computer problems (Compeau & Higgins, 1995; Howard, 2014). Like other specific forms of self-efficacy, it has been tied to goal setting and striving in regards to relevant tasks (Agarwal et al., 2000; Compeau & Higgins, 1995; Howard, 2014). Training self-efficacy may cause trainees to persist during training programs, in general, but computer self-efficacy may cause trainees to specifically persist through CBT programs. Due to the theoretical importance of computer self-efficacy, it is possible that TSE no longer predicts training outcomes during a CBT when accounting for this other specific form of self-efficacy, a hypothesis tested in the current article.

> **Hypothesis 5**: During a CBT, training self-efficacy positively predicts trainee reactions when accounting for positive self-evaluations, general self-efficacy, and computer self-efficacy.

Hypothesis 6: During a CBT, training self-efficacy positively predicts learning when accounting for positive self-evaluations, general self-efficacy, and computer self-efficacy.

A visual representation of these six hypotheses is presented in Figure 1.

Method

Participants.

Study 5 included 126 participants (Mage = 18.76, SDage = .90; 95% female; 69% Caucasian) recruited from an undergraduate student participant pool of a large university from the Northeastern United States in return for a small amount of course credit.

Procedure.

All procedures for the current study occurred in a lab setting. Upon arriving, participants were asked to complete a pre-training survey, which included the measures of TSE, self-esteem, general self-efficacy, locus of control, emotional stability, and computer self-efficacy. After completing this survey, participants were guided into another room in which they completed the training program (detailed subsequently). Afterwards, they returned to the original room and completed a post-training survey. This survey contained the measures of perceived learning and expected job self-efficacy, which were meant to represent trainee reactions. They also completed post-training tests to gauge actual learning, which included declarative knowledge and mental models.

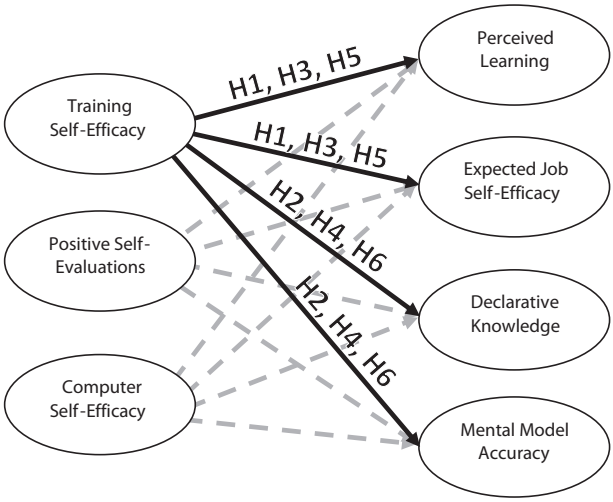

FIGURE 1. VISUAL REPRESENTATION OF STUDY HYPOTHESES AND DESIGN

Note: Solid, black lines represent hypothesized direct relationships. Dashed, grey lines represent effiects that are controlled while testing Hypotheses 3, 4, 5, and 6.

The lab CBT program was meant to represent a new employee training program. To begin, participants were read the following cover story to increase the realism of the experiment:

For the study today, you are going to pretend that you are an incoming employee at TopCo, a prestigious manufacturing company. You had to undergo several rounds of interviews to obtain this position, but you were finally selected amongst dozens of other applicants. Before starting your employment, TopCo sent you an email which included the program that you see on the monitor. The email noted that the program is a portion of the new employee orientation process. You are meant to use the program, before your first day, to learn more about TopCo and your job. Then, on your first day at work, TopCo will provide further information about your new job through a typical orientation course.

Participants then used a program that simulated the TopCo workplace using a standard computer setup (monitor, mouse, and keyboard). Participants controlled a customizable avatar, and they could talk with avatars of their coworkers placed within their respective offices. When talking with coworkers, participants were given information about TopCo and their new job, and a map was provided so participants could navigate the workplace easily to find their coworkers. Participants explored the program at their own pace for as long as they wanted, and they were told that their training was completed when they interacted with each of their 25 coworkers. Together, the training was meant to represent an experience that was similar to a naturalistic CBT, while providing instruction that could subsequently be tested.

Measures and Individual Differences

The 11-item TSES was administered. The scale's Cronbach's alpha was .93. The four items from the TSES that comprise the TSES-Short were also analyzed separately in the current study. The Cronbach's alpha of the TSES-Short was .85.

Computer self-efficacy.

Computer self-efficacy was gauged through the 12-item Computer Self-Efficacy Scale (CSES) created by Howard (2014). Its Cronbach's alpha was .90, and an example item is, "I can usually handle whatever computer problem comes my way."

General self-efficacy.

General self-efficacy was gauged through Chen et al.'s (2001) general self-efficacy measure. Its Cronbach's alpha was .94, and an example item is, "I am confident that I can perform effectively on many different tasks."

Self-esteem.

To measure self-esteem, the 10-item Rosenberg Self-Esteem Scale (RSES) was administered (Rosenberg, 1965). Its Cronbach's alpha was .89,

and an example item is, "I feel that I'm a person of worth, at least on an equal plane with others."

Locus of control.

Locus of control was gauged through a measure created by Levenson (1973). Its Cronbach's alpha was .70, and an example item is "My life is determined by my own actions."

Emotional stability.

Emotional stability was gauged through a measure taken from the International Personality Item Pool (Goldberg et al., 2006). Its Cronbach's alpha was .80, and an example item is, "I have frequent mood swings."

Trainee Reactions and Perceived Learning

The first indicator of trainee reactions was perceived learning, which was measured through a self-created, 12-item scale. An example item is, "If I took a test about the training program, I would probably receive a perfect score." The scale's Cronbach's alpha was .96. Due to a clerical error, 29 participants did not receive this measure.

Expected job self-efficacy.

Because the empirical study occurred in a lab setting, a true measure of post-training job self-efficacy could not be obtained. For this reason, expected job self-efficacy was measured as a second indicator of trainee reactions. To measure expected job self-efficacy, a self-created, 8-item scale was administered. An example item is, "I would be able to do my assigned job at TopCo." Each item was based on job self-efficacy items from prior measures but rewritten to fit the study. The scale's Cronbach's alpha was .88 after removing certain items (discussed in CFA results presented subsequently).

Learning and declarative knowledge.

Two measures were gauged for declarative knowledge gained from the training. Both measures were multiple-choice questionnaires, each with four possible answers for each item and only one correct answer. In addition, both questionnaires asked participants about direct information provided by the program. The first declarative-knowledge questionnaire contained 26 items, and an example item is "Who should you go to for day-to-day questions?" The second declarative-knowledge questionnaire contained 10 items, and an example item is "A product needs a new marketing scheme. Which department should plan it?" The first measure had a Cronbach's alpha of .71, and the second measure had a Cronbach's alpha of .53.

Mental model accuracy.

Two measures gauged the accuracy of mental models developed from the training, and these measures were adapted from prior studies

(Lim & Klein, 2006; Marks et al., 2002). The first measure provided a diagram depicting the interrelationships of the top management positions, but the names of the positions were not included. Instead, each position was represented by a blank square. Participants were asked to write in the management position that best fit the blank square, and a list of all the positions was provided. In this measure, seven blank squares were included, and model accuracy was gauged by the number of top management positions correctly labeled. The Cronbach's alpha for this measure was .84.

The second measure provided the name of each department (e.g., R&D Department, Testing Department), and participants were asked to draw a diagram of their interrelationships. For example, the R&D Department sends completed projects to the Testing Department, which would be represented by an arrow from the R&D Department to the Testing Department. Model accuracy was gauged by the reverse-coded sum of all missing arrows and erroneously added arrows between departments. The Cronbach's alpha for this measure was .90.

Results

Before conducting our primary analyses, we performed a series of CFAs with each individual difference and trainee reaction scale to ensure that the measures produced appropriate psychometric evidence in the current sample. Prior authors have suggested that adding covariance terms between the error terms of indicators representing the same latent construct is appropriate, as this variance in these items may have additional shared variance not explained by the latent factor due to similar wording (Brown, 2014; Hair et al., 2018; Kline, 2015). We added a covariance between error-term pairs if the respective modification indicator was large (>10), as long as either item did not already include a covariance with its associated error term; however, we removed items if the modification indices suggested that several (>2) covariances should be added to its respective error term, as an excessive number of added covariances suggests that the respective item may include systematic variance that is representative of another latent construct (e.g., construct contamination) (Brown, 2014; Hair et al., 2018; Kline, 2015).

The model-fit indices for each CFA met or approached cutoffs of acceptable fit (CFI = .93-.97, IFI = .93–.97, SRMR = .04-.06, $\chi 2/df = 1.42$-3.36). No more than three covariances were added for any scale, but three items were removed from the expected job self-efficacy. The reduced, 5-item measure had a correlation of .96 with the full 8-item scale, suggesting that the items could be removed without diminishing the construct coverage of the measure. This 5-item version was used for all subsequent analyses. Full reporting of these CFAs is presented in Supplemental Material A.

Correlations of all variables are included in Table 3. Hierarchical regressions were used to gauge the incremental predictive ability of TSE beyond positive self-evaluations, general self-efficacy, and computer

TABLE 3 CORRELATIONS OF ALL VARIABLES ADMINISTERED IN STUDY 5 (EMPIRICAL ANALYSIS)

	MEAN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1.) Training Self-Efficacy (TSES)	5.04	.83	.93												
2.) Training Self-Efficacy (TSES-Short)	5.22	.85	.92**	.85											
3.) Computer Self-Efficacy	4.34	1.00	.48**	.44**	.90										
4.) General Self-Efficacy	5.59	.86	.72**	.69**	.39**	.94									
5.) Self-Esteem	5.52	.93	.51**	.47**	23**	.67**	.89								
6.) Locus of Control	4.63	.51	.35**	.30**	.21**	.40**	.44**	.70							
7.) Emotional Stability	4.67	.89	.42**	.37**	.19*	.51**	.72**	.43**	.80						
8.) Perceived Learning	4.46	1.17	.41**	.41**	.21*	.36**	.18	.11	.11	.96					
9.) Expected Job Self-Efficacy	4.79	.93	.43**	.42**	.28**	.38**	.25**	.17	.24*	.52**	.88				
10.) Declarative Knowledge A	.61	.16	.09	.10	.02	.02	–.06	.09	–.05	.45**	.23**	.71			
11.) Declarative Knowledge B	.62	.19	.09	.08	.16	.09	.01	.01	.06	.42**	.33**	.64**	.53		
12.) Mental Models A	2.03	2.27	.00	.06	–.03	.01	–.05	.00	–.01	.34**	.27**	.31**	.31**	.84	
13.) Mental Models B	–15.07	7.10	.16	.15	.15	.08	.09	.12	.09	.21*	.08	.57**	.40**	.09	.90

Note: Variables above the dashed line were administered before the training program.
Variables below the dashed line were administered after the training program.
*$p < .05$.; **$p < .01$.

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TABLE 4 RESULTS OF HIERARCHICAL REGRESSION PREDICTING PERCEIVED LEARNING

VARIABLES	STEP 1		STEP 2		STEP 3	
	β	t	β	t	β	-
Constant		2.432*		1.722		1.681
1.) Training Self-Efficacy	.410	4.354***	.346	2.477*	.345	2.323*
2.) General Self-Efficacy			.188	1.257	.188	1.244
3.) Self-Esteem			–.027	–.178	–.027	–.177
4.) Locus of Control			–.046	–.407	–.046	–.404
5.) Emotional Stability			–.089	–.633	–.089	–.629
6.) Computer Self-Efficacy					.001	.012
R^2		.17		.19		.19

*$p < .05$.; **p < .01.; ***p < .001.

TABLE 5 RESULTS OF HIERARCHICAL REGRESSION PREDICTING JOB SELF-EFFICACY

VARIABLES	STEP 1		STEP 2		STEP 3	
	β	t	β	t	β	t
Constant		5.139***		2.876**		2.740**
1.) Training Self-Efficacy	.427	5.234***	.321	2.679**	.282	2.235*
2.) General Self-Efficacy			.150	1.085	.139	1.000
3.) Self-Esteem			–.062	–.444	–.055	–.392
4.) Locus of Control			–.008	–.081	–.013	–.137
5.) Emotional Stability			.073	.594	.074	.608
6.) Computer Self-Efficacy					.092	.969
R^2		.18		.19		.20

*$p \leq .05$.; **p ≤ .01.; ***p ≤ .001.

self-efficacy. In the first step, TSE was the only predictor. In the second step, general self-efficacy, self-esteem, locus of control, and emotional stability (collectively known as core-self evaluations) were entered into the regression. In the third step, computer self-efficacy was included. The hierarchical regression predicting perceived learning is shown in Table 4, the hierarchical regression predicting expected job self-efficacy is shown in Table 5, hierarchical regressions predicting declarative knowledge are shown in Table 6 (Measure A and Measure B), and hierarchical regressions predicting mental model accuracy are shown in Table 7 (Measure A and Measure B).

We also tested whether the data satisfied certain assumptions of regression analyses. First, we visually analyzed Q-Q plots and scatterplots. We did not observe any large deviations from normality or evidence

TABLE 6 RESULTS OF HIERARCHICAL REGRESSION PREDICTING DECLARATIVE KNOWLEDGE

MEASURE A						
VARIABLES	**STEP 1**		**STEP 2**		**STEP 3**	
	β	**t**	**β**	**t**	**β**	**t**
Constant		5.839***		3.301**		3.315**
1.) Training Self-Efficacy	.090	1.002	.157	1.215	.176	1.279
2.) General Self-Efficacy			–.033	–.220	–.028	–.185
3.) Self-Esteem			–.118	–.780	–.121	–.797
4.) Locus of Control			.137	1.329	.139	1.346
5.) Emotional Stability			–.077	–.577	–.078	–.581
6.) Computer Self-Efficacy					–.043	–.412
R^2		.01		.04		.04
MEASURE B						
Variables	**Step 1**		**Step 2**		**Step 3**	
	β	**t**	**β**	**t**	**β**	**t**
Constant		4.780***		3.193**		3.028**
1.) Training Self-Efficacy	.092	1.021	.052	.396	–.008	–.061
2.) General Self-Efficacy			.124	.824	.107	.713
3.) Self-Esteem			–.173	–1.136	–.162	–1.069
4.) Locus of Control			–.034	–.331	–.043	–.411
5.) Emotional Stability			.118	.883	.121	.907
6.) Computer Self-Efficacy					.141	1.363
R^2		.01		.02		.04

*$p < .05$.; **$p < .01$.; ***$p < .001$.

of nonlinear relationships. Second, we calculated skewness and kurtosis values for each variable. Most variables produced skewness and kurtosis values below one. Two variables produced a skewness value slightly above one (–1.094 & 1.193), and three variables produces a kurtosis value above one (1.198, 2.286, & 3.766). Many authors recommend that skewness does not pose a large issue for regression analyses until it exceed two, and these authors also recommend that kurtosis does not pose a large issue for regression analyses until it exceeds seven (Byrne, 2010; Curran et al., 1996; Hair et al., 2018). For this reason, we did not perform any corrections for skewness or kurtosis. Lastly, the collinearity statistics indicated that multicolinearity is not a concern, given that the tolerance values were no lower than .348 and the VIF statistics did not exceed 2.875. Common cutoffs for these statistics are .1 and 10, respectively (Hair et al., 2018). Therefore, common assumptions of regression analyses were supported in the current data, and the full results of these analyses are presented subsequently.

TABLE 7 RESULTS OF HIERARCHICAL REGRESSION PREDICTING MENTAL MODEL ACCURACY

MEASURE A						
VARIABLES	**STEP 1**		**STEP 2**		**STEP 3**	
	β	**t**	**β**	**t**	**β**	**t**
Constant		1.557		1.007		1.045
1.) Training Self-Efficacy	.004	.041	–.007	–.057	.011	.081
2.) General Self-Efficacy			.075	.494	.080	.525
3.) Self-Esteem			–.133	–.864	–.136	–.881
4.) Locus of Control			.010	.092	.012	.116
5.) Emotional Stability			.049	.363	.048	.355
6.) Computer Self-Efficacy					–.044	–.418
		.00		.01		.01
MEASURE B						
Variables	**Step 1**		**Step 2**		**Step 3**	
	β	**t**	**β**	**t**	**β**	**t**
Constant		5.529***		4.013***		4.097***
1.) Training Self-Efficacy	.164	1.824	.206	1.589	.167	1.224
2.) General Self-Efficacy			–.121	–.808	–.134	–.888
3.) Self-Esteem			.020	.134	.028	.183
4.) Locus of Control			.091	.885	.087	.844
5.) Emotional Stability			.019	.143	.021	.162
6.) Computer Self-Efficacy					.095	.914
		.03		.04		.05

*$p < .05$.; **$p < .01$.; ***$p < .001$.

Hypothesis 1 proposed that TSE would positively predict trainee reactions. The first step of the hierarchical regressions predicting perceived learning (B = .571, Std. Err. = .131, β = .410, t = 4.354, $p < .001$) and expected job self-efficacy (B = .503, Std. Err. = .096, β = .427, t = 5.234, $p < .001$) indicated that TSE significantly predicted trainee reactions, supporting Hypothesis 1.

Hypothesis 2 proposed that TSE would positively predict learning. The first step of the hierarchical regressions predicting declarative knowledge (Measure A, B = .017, Std. Err. = .017, β = .090, t = 1.002, $p > .05$; Measure B, B = .021, Std. Err. = .021, β = .092, t = 1.021, $p > .05$) and mental models (Measure A, B = .001, Std. Err. = .036, β = .004, t = .041, $p > .05$; Measure B, B = .104, Std. Err. = .057, β = .164, t = 1.824, $p > .05$) were not significant, indicating that TSE did not predict learning. Hypothesis 2 was not supported.

Hypothesis 3 proposed that TSE is a positive predictor of trainee reactions when accounting for general self-efficacy and other positive

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TABLE 8 RESULTS OF REORDERED HIERARCHICAL REGRESSIONS

	PERCEIVED LEARNING				EXPECTED JOB SELF–EFFICACY			
VARIABLES	**STEP 1**		**STEP 2**		**STEP 1**		**STEP 2**	
	β	**T**	**β**	**T**	**β**	**T**	**β**	**t**
Constant		1.670		1.681	2.941**		2.740**	
1.) General Self–Efficacy	.369	2.787**	.188	1.244	.304	2.534*	.139	1.000
2.) Self–Esteem	–.003	–.019	–.027	–.177	–.056	–.397	–.055	–.392
3.) Locus of Control	–.017	–.146	–.046	–.404	–.004	–.045	–.013	–.137
4.) Emotional Stability	–.069	–.481	–.089	–.629	.096	.772	.074	.608
5.) Computer Self–Efficacy	.085	.801	.001	.012	.158	1.737	.092	.969
6.) Training Self–Efficacy			.345	2.323*			.282	2.235*
R^2		.14		.19		.14		.17

	Declarative Knowledge								Mental Model Accuracy							
	Measure A				Measure B				Measure A				Measure B			
Variables	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2		Step 1		Step 2	
	β	t	β	t	β	t	β	t	β	t	β	t	β	t	β	t
Constant	3.458***		3.315**		3.051**		3.028**			1.063		1.045	3.960***		4.097***	
1.) General Self–Efficacy	.073	.564	–.028	–.185	.102	.802	.107	.713	.087	.667	.080	.525	.037	.288	–.134	–.888
2.) Self-Esteem	–.121	–.793	–.121	–.797	–.162	–1.074	–.162	–1.069	–.136	–.884	–.136	–.881	–.029	–.190	.028	.183
3.) Locus of Control	.146	1.411	.139	1.346	–.043	–.417	–.043	–.411	.013	.121	.012	.116	–.090	–.880	.087	.844
4.) Emotional Stability	–.066	–.492	–.078	–.581	.120	.909	.121	.907	.049	.363	.048	.355	–.030	–.226	.021	.162
5.) Computer Self–Efficacy	.000	–.002	–.043	–.412	.139	1.424	.141	1.363	–.041	–.416	–.044	–.418	–.134	–1.360	.095	.914
6.) Training Self–Efficacy			.176	1.279			–.008	–.061			.011	.081			.167	1.224
R^2		.03		.04		.04		.04		.01		.01		.03		.05

*$p < .05$; **$p < .01$; ***$p < .001$.

self-evaluations. The second step of the hierarchical regressions predicting perceived learning (B = .481, Std. Err. = .194, β = .346, t = 2.477, p < .05) and expected job self-efficacy (B = .378, Std. Err. = .141, β = .321, t = 2.679, p < .01) indicated that TSE still significantly predicted trainee reactions. Also, in two separate hierarchical regression analysis with TSE included after general self-efficacy and other positive self-evaluations, the change in R2 from the inclusion of TSE was significant for both perceived learning (F = 6.136, p < .05) and expected job self-efficacy (F = 5.498, p < .05). These results demonstrate that TSE provides incremental information beyond general self-efficacy and other positive self-evaluations when predicting trainee reactions.

Hypothesis 4 proposed that TSE is a positive predictor of learning when accounting for other positive self-evaluations. As TSE was not a significant predictor alone, it was unlikely that it would become predictive of learning when controlling for these other variables, which was found to be the case (p > .05). Training self-efficacy does not provide incremental information beyond general self-efficacy and other positive self-evaluations for predicting learning.

Hypothesis 5 proposed that, during a CBT, TSE is a positive predictor of trainee reactions when accounting for positive self-evaluations, general self-efficacy, and computer self-efficacy. The third step of the hierarchical regressions predicting perceived learning (B = .481, Std. Err. = .207, β = .345, t = 2.323, p < .05) and expected job self-efficacy (B = .333, Std. Err. = .149, β = .282, t = 2.235 p < .05) indicated that TSE still significantly predicted trainee reactions. In two separate hierarchical regression

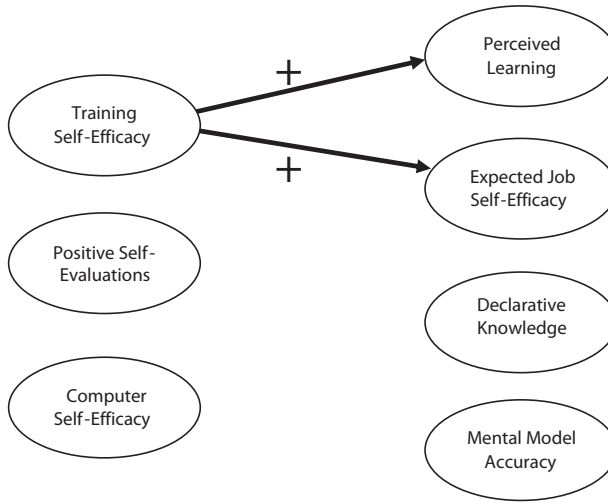

FIGURE 2. VISUAL ILLUSTRATION OF STUDY RESULTS

Note: Training self-efficacy was the independent variable. Perceived learning, expected job self-efficacy, declarative knowledge, and mental model accuracy were dependent variables. Positive self-evaluations and computer self-efficacy were control variables.

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analyses with TSE included after general self-efficacy, other positive self-evaluations, and computer-self efficacy, the change in R2 from the inclusion of TSE was significant for both perceived learning ($F = 5.394$, $p < .05$) and expected job self-efficacy ($F = 4.997$, $p < .05$). This result is included in Table 8. These results demonstrate that, during a CBT, TSE provides incremental information beyond positive self-evaluations, general self-efficacy, and computer self-efficacy when predicting trainee reactions.

Hypothesis 6 proposed that during a CBT, TSE is a positive predictor of learning when accounting for positive self-evaluations, general self-efficacy, and computer self-efficacy. Once again, it was unlikely that TSE would become predictive of learning when controlling for these other variables, which was found to be the case ($p > .05$). During a CBT, TSE does not provide incremental information beyond positive self-evaluations, general self-efficacy, and computer self-efficacy when predicting learning. Figure 2 visually represents all results.

Discussion

In the current article, two psychometrically sound and valid TSE scales, the TSES and the TSES-Short, were created through a 4-study process. Then, the TSES was applied to understand, during a CBT, the effects of TSE alongside positive self-evaluations, general self-efficacy, and computer self-efficacy. The results showed that TSE positively predicts trainee reactions from a CBT beyond positive self-evaluations, general self-efficacy, and computer self-efficacy; however, no variable significantly predicted learning, even when the predictive ability of TSE was tested alone. These results have several implications for research and practice.

These results provide inferences about the suitability of the TSES and TSES-Short for measuring TSE. Both scales demonstrated satisfactory psychometric properties in Studies 2 and 3 and convergent validity in Study 4. In addition, while the primary purpose of the empirical study (Study 5) was to investigate the nature of TSE, the results also support the scales' concurrent and predictive validity. Together, these results further support that the two scales likely measure TSE, and future use of the TSES and TSES-Short is warranted.

In addition to inferences about measurement, the current results provide many inferences about TSE. While strongly related, TSE is distinct from general self-efficacy, computer self-efficacy, and other positive self-evaluations. The observed relationships of these constructs are typical for closely related self-evaluations (Avey et al., 2010; Luthans et al., 2007; Peterson et al., 2011), and therefore were expected in the current instance.

The significant relationship between TSE and trainee reactions, even when accounting for positive self-evaluations, general self-efficacy, and computer self-efficacy, is a noteworthy finding. The increased specificity

of TSE may allow the construct to better predict relevant outcomes than general measures. Studies that gauge self-efficacy for a particular task or activity produce greater effects when predicting relevant outcomes than studies investigating general self-efficacy (Bandura, 2012, 2015; Woodruff & Cashman, 1993), and the specificity of TSE may likewise allow it to predict trainee reactions better than positive self-evaluations.

Alternatively, a large amount of research has discovered that the factors that relate to learning may differ from the factors that relate to general employee performance (Hirst et al., 2009; Wulf et al., 2010). It is possible that TSE triggers different psychological mechanisms than general self-efficacy, as TSE is inherently focused on learning processes. These differing psychological mechanisms may cause TSE to predict certain training outcomes, such as trainee reactions, more effectively than general self-efficacy. More research, particularly on the mediators of TSE and relevant outcomes is needed to empirically demonstrate and support this proposed notion; however, relevant theories on learning may be able to guide these studies, allowing authors to predict the differences between TSE and general self-efficacy.

The non-significant relationship between TSE and learning, even when analyzed alone, is noteworthy. In prior studies, authors have shown that TSE may predict skill transfer (Carlson et al., 2000; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Chiaburu et al., 2010), which is often believed to be preceded by learning; however, these studies may have significant methodological concerns. Many of these studies use measures that may not actually gauge TSE, such as Noe and Wilk's (1993) scale, and the observed relationships may instead reflect the impact of general or job self-efficacy. Also, many of these studies gauge skill transfer in a similar manner to perceived learning in the current study through self-report measures, but the authors consider these measures representative of actual transfer. As prior authors have noted (Anaya, 1999; Benbunan-Fich, 2010; Pike, 2011), self-reported measures of learning and transfer are more reflective of reactions than actual learning or transfer, thereby providing little information about the relationship of TSE and learning or transfer. Thus, while Study 5 is not without its limitations, the current results and methodological concerns of prior studies create some doubt about the relationship between TSE and learning.

Furthermore, theoretical justifications can be provided to suggest that TSE has little, if any, relationship with learning. During a training program, trainees are most often provided clear and direct goals, such as particular tasks to perform or material to learn (Bell & Kozlowski, 2008; Ford, 2014; Salas et al., 2009). Those high in TSE are believed to set challenging training goals, a primary benefit of the construct, but this benefit is taken away during most training programs. Also, trainees may already be motivated to perform well during the training, as direct organizational outcomes (i.e. pay, promotion) are often associated with training performance. A primary benefit of TSE, improvements to training

motivation, may be rendered moot during many training programs. While other specific forms of self-efficacy may have their benefits emerge across most relevant contexts, the same may not be true for TSE, causing the construct to be less predictive than expected when studying certain training outcomes, such as learning.

Given these findings, the importance of TSE should be considered, given that the sole benefit of TSE is often assumed to be its influence on learning and transfer of training. We suggest that TSE still has an important influence on employee and organization success, due to its influence on trainee reactions. While trainee reactions are often used as indicators of training success, organizations also use employee self-assessments of post-training abilities to determine whether any additional training is needed (Baron & Morin, 2010; Gegenfurtner et al., 2013; Saks, 1994, 1997). If trainees' perceptions are downwardly biased due to poor pre-training self-evaluations of TSE, then the organization could needlessly enroll the employees into more training programs. When paired with lost resources due to the trainees being unable to begin their duties, these cumulative effects could prove costly for the organization. Therefore, we suggest that researchers should continue to investigate the outcomes and methods to improve TSE, and practitioners should ensure that their trainees possess positive self-evaluations of TSE before starting their training programs.

Future Directions

Several future directions should be considered for the TSES, TSES-Short, and TSE. As with any scale, several aspects of the TSES and TSES-Short should be further investigated, such as the validity of the measures. Theoretically, the TSES and TSES-Short should be related to a multitude of other variables, such as transfer-of-training and eventual employee performance.

Authors should also reinvestigate relationships of TSE already studied in prior research. Measures applied in prior research are often questionable, and they may not gauge TSE at all (Noe & Wilk, 1993). Several relationships assumed to exist may not emerge when reanalyzing TSE with the new measures, which would alter current understanding of the construct.

Further, the relationship between TSE and learning should be reevaluated in different settings. Although a lab study was performed in the current article to ensure internal validity, future research should investigate TSE and learning in a naturalistic setting to ensure external validity (Cook & Campbell, 1976; Shadish et al., 2002). Although it is not expected that a naturalistic study would discover different results, a reanalysis would aid in the understanding of the construct, even if a null relationship were found. Recent authors have begun to question the relationship between self-efficacy with performance-related outcomes, with

some suggesting that the relationship is much weaker than commonly believed (Beck & Schmidt, 2015; Yeo & Neal, 2013). Replicating the null relationship between TSE and learning would parallel other research on self-efficacy, and the result could be easily integrated into contemporary literature. Thus, reevaluating the relationship between TSE and learning is important, and the discovery of further null relationships would be in agreement with some modern thought on self-efficacy.

Relatedly, the current article focuses on the outcomes of TSE, but authors have also shown an interest in the antecedents of the construct. Several variables have been proposed to increase TSE, such as prior training success or organizational interventions (Carter & Beier, 2010; Guthrie & Schwoerer, 1994, 1996). By discovering these antecedents, practitioners may be able to elicit TSE in employees, possibly resulting in improved organizational outcomes.

Finally, researchers should strive to apply effective research methods. Currently, a heavy reliance is placed upon single-source, single-method studies. For instance, many authors use the simple survey design, and participants provide self-reports for all study variables (Brown & Warren, 2009; Carter & Beier, 2010; Guthrie & Schwoerer, 1994, 1996). As ample research has shown, single-source, single-method studies have provided artificially inflated results and obscure the true nature of relationships. Future research could avoid this concern by obtaining supervisor ratings of training outcomes or administering post-tests to gauge learning. Similarly, authors should avoid self-report measures of perceived learning as an indicator of actual learning. Self-reported measures of learning are more reflective of reactions than actual learning (Anaya, 1999; Benbunan-Fich, 2010; Pike, 2011), and results from these measures, when interpreted incorrectly, may cause inaccurate conclusions about TSE.

Limitations

Certain limitations of the current study should be highlighted. In Study 5, self-created scales were administered to gauge perceived learning and expected job self-efficacy. These scales were closely adapted from prior measures to better fit the lab scenario. For example, it was assumed that items akin to "I would be able to do my assigned job at TopCo." "would better gauge participants' feelings about the training program than items akin to, "I would be able to do my assigned job." At the same time, prior psychometric and validity information does not exist for these scales. The CFAs presented in Study 5 and Supplemental Material A partially alleviate these psychometric concerns. The measures produced appropriate model fit, even using a small sample size that could produce conservatively-biased (worse) estimates (Brown, 2014; Hair et al., 2018; Kenny, 2015; Kline, 2015). Similarly, the observed correlations presented in Study 5 and Table 3 partially alleviate these validity concerns, because the measures demonstrated theoretically expected relationships with the

other administered variables. The two measures had strong correlations with each other as well as the objective outcomes of learning. Therefore, while the current article cannot provide absolute support for the perceived learning and expected job self-efficacy scales, these results suggest that the measures are appropriate.

Relatedly, it could not be said for certain that the previously supported measures (e.g., the RSES & CSES) would produce satisfying psychometric and validity information in the context of Study 5 (lab study with student sample). The provided CFAs and correlations help alleviate these concerns, and ample prior support for these scales in similar samples alleviates these concerns (Chen et al., 2001; Goldberg et al., 2006; Howard, 2014; Rosenberg, 1965). Nevertheless, absolute support cannot be provided given the current data.

Concerns could also be raised for our primary reporting of regression analyses in Study 5 rather than more sophisticated approaches, such as structural-equation modeling (SEM). The primary goal of Study 5 was to test the relationships between variables in a lab study, and thereby we were less interested in analyzing the properties of indicators using techniques that require large sample sizes. Nevertheless, results of SEM analyses using a total aggregation approach are provided in Supplemental Material B, which replicated the findings of the regression analyses. Thus, the results of the regression analyses were found to be robust.

Criticisms could also be raised for our choice of samples: student and mTurk participants. Many prior studies have defended the use of these samples, especially when appropriate steps are taken to ensure sufficient motivation (e.g., attention checks), and several of these studies have even shown that results from these samples are comparable to results from the general, Western population (Brawley & Pury, 2016; Fleischer et al., 2015; Hauser & Schwarz, 2016; Necka et al., 2016; Smith et al., 2016). Likewise, we underwent typical approaches to ensure that a random subset of participants was sampled from these populations while adhering to IRB guidelines; a link was provided to a pool of potential participants, and these participants voluntarily self-selected into the study. Nevertheless, future studies should strive to replicate these results using different samples to ensure generalizability.

Finally, we intentionally chose not to measure the ultimate outcomes of training programs: post-training transfer and performance. This was because trainee reactions and learning are entirely determined by effects before and during the training, such as TSE. On the other hand, transfer and performance can be influenced by effects after the training, such as transfer climate, which may dampen the effects of any individual difference, such as TSE. As the current study was focused on observing the relative impact of many individual differences, reactions and learning were chosen as the primary outcomes to obtain an accurate relative comparison of their effects without any post-training influences. Future research, however, should begin to investigate these more distal outcomes of TSE.

Conclusion

The current article addresses two concerns with TSE research. The first concern was addressed through the creation of two psychometrically sound and valid measures, entitled the TSES and the TSES-Short. The second concern was addressed by analyzing the relationship of TSE with important training outcomes during a CBT, in conjunction with positive self-evaluations, general self-efficacy, and computer self-efficacy. The results demonstrated that when all other variables are included, TSE was a significant predictor of trainee reactions but not learning. While the increased specificity of TSE may be the cause of the results, novel theoretical perspectives may be able to better explain the results. Thus, the current article provides several inferences for current research and opens several avenues for future research.

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Appendix A – The Training Self-Efficacy Scale and the Training Self-Efficacy Scale – Short

1 – Strongly Disagree
2 – Disagree
3 – Slightly Disagree
4 – Neither Disagree or Agree
5 – Slightly Agree
6 – Agree
7 – Strongly Agree

Training Self-Efficacy Scale (TSES)

1. When faced with an unfamiliar problem in a training program, I expect to be able to solve it.
2. When I take training course in unfamiliar areas, I expect to be able to do well in them.
3. When facing difficult training tasks, I am certain that I will accomplish them.
4. I will be able to successfully overcome most any training challenge.
5. Even when training tasks are tough, I can perform quite well.
6. I can always manage to solve difficult training tasks if I try hard enough.
7. I am confident that I could deal efficiently with unexpected training events.
8. When confronted with a training program, I can usually find several solutions.
9. Even if I was unfamiliar with a topic, I could do well in a training program.
10. I am confident that I could perform well in a training program.
11. I feel confident that I can learn efficiently from training programs.

Training Self-Efficacy Scale – Short (TSES-Short)

1. Even when training tasks are tough, I can perform quite well.
2. I can always manage to solve difficult training tasks if I try hard enough.
3. I am confident that I can deal efficiently with unexpected training events.
4. I am confident that I could perform well in a training program.