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Can I teach students with Autism Spectrum Disorder?: Investigating teacher self-efficacy with an emerging population of students



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ABSTRACT

Currently, 1 in 68 children in the U.S. is diagnosed with Autism Spectrum Disorder (ASD; Centers for Disease Control & Prevention, 2015) and this growing population of learners has been noted as one of the most challenging groups to teach. Teacher self-efficacy, the belief teachers hold about their instructional capabilities, has been shown to differ according to contextual factors, such as the type of students teachers face. The purpose of this investigation was to develop an instrument that can be used to measure teachers' self-efficacy for effectively working with students with ASD. Study 1 involved the development and evaluation of a new instrument, the Teacher Self-Efficacy for Students with Autism Scale (TSEAS) with a sample of general and special education teachers in the U.S. ($N = 120$). Study 2 involved a cross-validation of the measure with teachers in Australia ($N = 85$). Results indicated that the scale represented a unidimensional construct in both studies. Self-efficacy for teaching students with ASD was distinct from, though positively related to, general teaching self-efficacy, job satisfaction, and self-regulation. Using a student-specific teaching self-efficacy measure might provide more useful information for supporting teachers' beliefs for teaching students with ASD.

What This Paper Adds

This paper provides initial psychometric evidence for an instrument that can aid researchers and practitioners wanting to measure self-efficacy for teachers working with individuals with ASD. Using a student-specific teaching self-efficacy measure might provide more useful information for supporting teachers' beliefs for teaching students with ASD. As teacher self-efficacy has been previously established as an important factor to consider when holistically looking at a teacher's effectiveness, this measure can aid to address concerns specific to working with students with ASD. Successful measures of teacher self-efficacy have been shown in other domains to be related to teacher behaviors, environmental decisions, and related student outcomes. This study is a starting point for understanding more about teachers' beliefs when working with students with ASD and how teacher beliefs for working with this population of students might relate to important variables.

1. Introduction

On a daily basis, teachers' effectiveness is influenced by a number of elements. These elements might include teachers' training,

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their personal beliefs, and their confidence (or doubts) they have about their students. Having a way to measure these elements can lead to directed interventions aimed at supporting teachers in areas where they feel most vulnerable. In addition to assessing concrete elements such as teaching skills, understanding teachers' unique personal capability beliefs can potentially provide greater insight into how effective they will be at their professional task. Indeed, according to Bandura (1997), "People's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (p. 2). If teachers believe they can help their students learn, they are more likely to use positive instructional strategies and classroom management techniques, and to report higher levels of well-being (Zee & Koomen, 2016).

This particular study targets one type of belief, *teacher self-efficacy*. Teachers' sense of their own efficacy varies according to the diverse contexts and learners they face (Tschannen-Moran & Woolfolk Hoy, 2001). This study focuses specifically on one population of learners: children with Autism Spectrum Disorder (ASD). Currently, 1 in 68 children in the U.S. is diagnosed with ASD (Centers for Disease Control & Prevention, 2015) and this growing body of learners has been noted as one of the most challenging groups to teach (White, Smith, Smith, & Stodden, 2012). Teaching students with ASD requires knowledge of best practices specific to students with ASD, and this knowledge is still emerging. Teachers of students with ASD must also understand how the symptoms of ASD may affect the learner and be accommodated via individualized instructional approaches. General education teachers likely vary in the degree to which they feel capable of carrying out such individualized instruction. Investigating ways to measure the beliefs held by regular education teachers about their capabilities to teach children with ASD may help researchers and practitioners identify areas in which interventions and professional development opportunities can be more responsive to individual teachers' needs.

2. Theoretical framework

This study is grounded in social cognitive theory, which identifies teachers and learners as active participants who are "self-organizing, proactive, self-reflecting, and self-regulating" (Pajares & Usher, 2008, p. 392). Social cognitive theory posits that all human functioning is the result of reciprocal interactions among environmental, behavioral, and personal factors. Because of their capacity for self-influence, people's beliefs play a role in how they behave in the diverse circumstances they face (Bandura, 1997). Of the many beliefs that guide teachers throughout their professional lives, perhaps none has been as central to their success as teachers' self-efficacy, defined as "teachers' belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated" (Guskey & Passaro, 1994, p. 628). This is because beliefs about one's personal efficacy can influence how much effort one gives to a task, how much time one spends persisting in the face of obstacles, and the amount of stress one experiences (Bandura, 1997) (Fig. 1).

Teacher self-efficacy has been the focus of a large body of research. High levels of teacher self-efficacy have been shown to be associated with positive teaching behaviors including exceptional classroom organization, clear expectations, and quality instruction (Schwarzer & Hallum, 2008). Self-efficacious teachers also demonstrated improved classroom management techniques and promotion of positive strategies for dealing with challenging behaviors (Emmer & Hickman, 1991). In addition, teachers report lower levels of stress and burnout in combination with higher levels of teacher self-efficacy (Schwarzer & Hallum, 2008).

Teachers with high levels of self-efficacy report higher levels of job satisfaction and are less likely to consider quitting the profession (Caprara, Barbaranelli, Steca, & Malone, 2006; Klassen et al., 2012). A sense of professional competence also plays a central role in how well teachers motivate and guide their students. According to Bandura (1997), teachers with a high sense of teaching efficacy believe that even difficult students can be taught through appropriate strategies, effective teaching, and supportive networks.

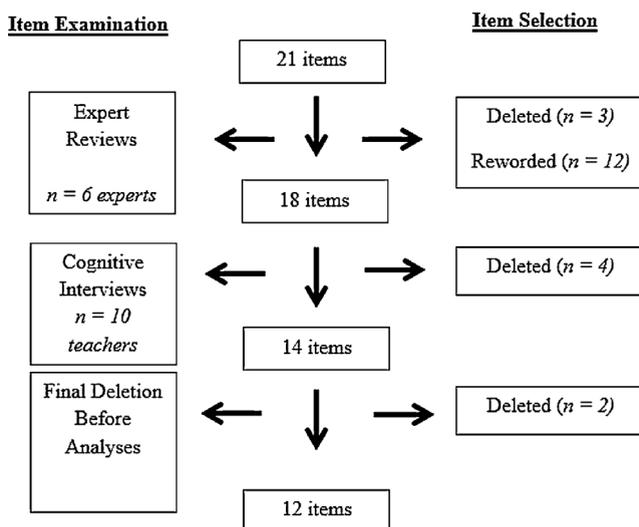


Fig. 1. Item writing process used in Study 1.

Teachers' efficacy beliefs are not universal, however. Whether or not one feels like a capable teacher depends in part on the changing demands of one's teaching environment. Bandura's (1997) own theorizing underscores the context-specificity of efficacy judgments, which represent "a dynamic, multifaceted belief system that operates selectively across different activity domains and under different situational demands, rather than being a decontextualized conglomerate" (p. 42). Despite this injunction, much of the research on teachers' self-efficacy to date has largely ignored important contextual factors such as the nature of the content area, school climate, or student characteristics (Klassen et al., 2012). It is crucial, therefore, to examine self-efficacy within the specific context of interest.

Some teacher self-efficacy studies have focused on a specific subject domain of interest (e.g., math, reading, writing), but researchers have suggested that person-specific measures of teacher self-efficacy may help researchers pinpoint where additional supports are needed for teaching challenging populations of students, such as those with ASD (Ruble, Usher, & McGrew, 2011). We have therefore elected to focus on this particular population of students—those diagnosed with ASD. We also assess teachers' domain-general self-efficacy for teaching across diverse contexts to determine whether teachers judge themselves differently when considering their capabilities to teach specific learners versus learners in general. We expect teachers' general teaching self-efficacy and their self-efficacy for teaching students with ASD would be positively related.

2.1. Assessing self-efficacy for teaching students with ASD

The rising incidence of ASD in the U.S. and Australia make research relevant to learners with ASD both timely and significant (White et al., 2012). Furthermore, researchers have shown that teachers' beliefs are positively correlated with learning outcomes of students' with ASD (Segall & Campbell, 2014). Federal education laws in the U.S., such as the 1975 Education for All Handicapped Children Act, have led to the inclusion of learners with special needs in the least restrictive learning environment—often the regular education classroom (Mastropieri & Scruggs, 2014). Similarly, the 2013 Australian Education Act describes the expectation that students with disabilities attend a number of school environments, indicating that both regular and special educators will teach them, depending on the chosen environment. Understanding how both general and special education teachers judge their own efficacy for handling students with diverse learning needs is therefore of considerable value.

Generalized instruments of teacher self-efficacy are the most frequently used in teacher self-efficacy literature (Klassen, Tze, Betts, & Gordon, 2011), yet task- and context-specific measures are needed for accurately assessing self-efficacy's relationship to other variables (Bong, 2005). Teachers must not only be knowledgeable in their content domain and effective in their pedagogical delivery, they must deal effectively with a variety of students, including those they find most challenging. Teacher self-efficacy scales have been developed to address various aspects of special education generally (e.g., Guo, Dynia, Pelatti, & Justice, 2014). Few studies, however, have investigated teachers' self-efficacy for working with specific special education student populations, as teachers often have different beliefs about different kinds of students (Tschannen-Moran & Woolfolk Hoy, 2001). Our own ERIC database title search for the terms "self-efficacy" and "teacher" or "teachers" in the context of special education returned 22 articles, only two of which addressed specific student populations using student-specific measurement techniques (i.e., students with hearing impairments, Hartmann, 2012; and students with ASD, Ruble, Toland, Birdwhistell, McGrew, & Usher, 2013). Ruble et al. (2013) aimed to produce an instrument that "assessed the beliefs of special education teachers about their ability to carry out their professional tasks associated with teaching students with autism," which they called the Autism Self-Efficacy Scale for Teachers (ASSET; p. 1153). The goal of this study is different from Ruble et al. in that it will include items that can be answered by both general and special education teachers. Furthermore, the ASSET items reference teaching tasks that are specific to special education teachers. By contrast, this study aims to provide a measure that can be used by teachers in all environments. This approach takes into account the fact that the "least restrictive environments" for two learners with ASD can differ markedly. However, because the purpose of the study by Ruble et al. is similar to ours, the ASSET was used as a reference when writing items for this study.

Similar student-specific teaching self-efficacy measures have recently been tested to examine whether they can provide new information about intra-individual differences, or the different levels of self-efficacy experienced by a teacher when teaching diverse learners (Zee, Koomen, Jellesma, Geerlings, & de Jong, 2016). Researchers then examine variability within teachers' ratings. Zee et al. (2016) argued that one benefit of a student-specific measure is that "teachers may be less likely to respond in a socially desirable direction, as they may rather ascribe their low self-efficacy to characteristics of particular students, than to their incompetent self" (p. 41). Although such measures ask teachers to rate their self-efficacy for teaching specific students (adapted from Tschannen-Moran and Woolfolk Hoy's (2001) scale), none has specifically focused on students with ASD (Zee et al., 2016). The present study is distinct in that we ask teachers to judge their capabilities for teaching one-specific student with ASD and compare that to their perceptions about teaching in general. Boujut, Popa-Roch, Palomares, Dean, and Cappe (2017) addressed the self-efficacy of teachers of students with ASD; however, their study used a general self-efficacy measure to investigate the self-efficacy of teachers who work with students with ASD. This study aims to be accurate and specific in measurement of this important construct in order to gain more variability and understanding about this teacher belief. Investigating different types of students is important as researchers learn more about how teachers' beliefs vary according to student characteristics.

3. Research questions

Two studies and three primary research questions guided this investigation. Data were collected from teachers in two national contexts: the U.S. (Study 1) and Australia (Study 2). The purpose of Study 1 was to develop a measure suitable for assessing teachers' self-efficacy for teaching students with ASD and to examine how this student-specific self-efficacy was related to teaching self-efficacy

in general and to other teacher beliefs. The following questions guided each study:

Study 1:

- 1 What is the underlying internal structure of items designed to assess self-efficacy for teaching students with ASD?
- 2 What is the relationship between self-efficacy for teaching students with ASD and other teacher-relevant variables in the U.S.? As discussed earlier, we hypothesized the highest correlation would be between self-efficacy for teaching students with ASD and general teacher self-efficacy. We hypothesized a small, positive correlation between self-efficacy for teaching students with ASD and job satisfaction and self-regulation, as would be consistent with previous research. As a second aim, we considered how teachers' reports differ in a second national context to examine differences between teachers across multiple perspectives, as recommended by Klassen et al. (2009). Knowing that teachers work with students with ASD in a variety of environments, we determined that a more diverse sample would help examine whether the new measure is appropriate across contexts. Study 2 was therefore guided by a single question:
- 3 What is the relationship between self-efficacy for teaching students with ASD and other teacher-relevant variables in Australia? To further our evidence for validity, we expected to find similar results as found in study 1, with scores from the measure of self-efficacy for teaching students with ASD correlating with scores from the measures of general teacher self-efficacy, job satisfaction, and self-regulation.

4. Study 1

The goal of Study 1 was to develop a measure suitable for assessing teachers' self-efficacy for teaching students with ASD. As recommended by American Educational Research Association (AERA), American Psychological Association (APA), and National Council on Measurement in Education (NCME) (2014), we followed multiple steps to establish evidence for the validity of the newly-created instrument. Each source of evidence described below was used to increase the degree to which these student-specific teaching self-efficacy scores can be accepted as reliable and valid.

4.1. Method

4.1.1. Self-efficacy scale development procedures

To build evidence for content validity, items designed to assess self-efficacy for teaching students with ASD underwent a rigorous examination to ensure that they reflected the construct of interest. We followed established guidelines and processes for item creation, which included a detailed literature review, consultation with experts, cognitive interviews, and repetitive item writing (Bensen & Clark, 1982; DeVellis, 2003; Kline, 1986; Thorndike & Thorndike-Christ, 2010).

4.1.2. Item writing

Items were designed to measure teachers' perceptions of their own capability to carry out specific teaching tasks with students' with ASD. Item content was derived primarily from two current teaching self-efficacy scales and modified according to Bandura's (1997, 2006) guidelines to ensure a strong theoretical foundation and clear wording. Items were first adapted from Tschannen-Moran and Woolfolk Hoy (2001) Teacher Sense of Efficacy Scale due to its widespread use in teacher self-efficacy research (see Klassen et al., 2011, for a review). The Teacher Sense of Efficacy Scale's items represent three factors: self-efficacy for classroom management, self-efficacy for instruction, and self-efficacy for student engagement. We mirrored these general areas when crafting items for the present study. To ensure that teachers considered the ASD-specific population when responding to items, we instructed them to think about a specific student with ASD (see Table 1). The decision to ask teachers to consider a particular student with ASD was based on findings revealed from cognitive interviews in which teachers expressed the challenge of considering students with diverse symptoms of ASD. Rather than asking teachers to aggregate their judgments about working with all students they had ever taught, we therefore invited them to focus on their capabilities with one student with ASD. This approach is consistent that used by with other researchers who have attempted to measure this construct (e.g., Ruble et al., 2013). We adapted items from the Autism Self-Efficacy Scale for Teachers (ASSET; Ruble et al., 2013), which was designed to assess special education teachers' self-efficacy for dealing with a particular student with ASD. Twenty-one initial items were created. We used a 4-point Likert-type response (1 = *not certain at all*, 2 = *a little certain*, 3 = *somewhat certain*, 4 = *very certain*) based on recommendations from previous self-efficacy research (Smith et al., 2003; Toland & Usher, 2015).

4.1.3. Consultation with experts

Six academic experts in the fields of ASD ($n = 3$) and self-efficacy ($n = 3$) were consulted about the items on the student-specific self-efficacy instrument. Experts were identified as academic researchers with a primary research focus of either ASD or self-efficacy and were asked to rate whether each item captured "an important component of teacher self-efficacy when teaching a student with autism" (i.e., item content) and whether "the wording of this question is clear and unlikely to result in ambiguous interpretation" (i.e., item clarity). The expert rating scale ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). Experts were also invited to provide additional comments or concerns. All expert feedback was collected via an online survey. Based on experts' collective evaluation of item content and clarity, 12 items were reworded and 3 were deleted.

Table 1
Factor Analysis Results From the Unidimensional Solution Based on the 12-Item Teacher Self-Efficacy for Autism Scale.

Item	h^2	λ
1. Motivate this student when he or she shows low interest on a topic	.71	.84
2. Keep this student on task during difficult assignments	.59	.77
3. Resolve a disruptive behavior	.48	.69
4. Sustain a positive student-teacher relationship	.50	.71
5. Provide meaningful experiences	.55	.74
6. Make expectations clear about classroom behavior	.37	.61
7. Establish routines to keep activities running smoothly	.46	.68
8. Gauge student comprehension.	.36	.60
9. Differentiate instruction when appropriate	.34	.58
10. Facilitate appropriate social interactions with peers	.58	.76
11. Manage transition times	.49	.70
12. Address student's individual education plan (IEP) goals	.31	.56
13. Accommodate assessments when necessary	.14	.38
14. Collaborate with special educator (SPED)	.17	.41
% variance		43.21
Response Format		
Not certain at all A little certain Somewhat certain Very certain		

Note. % variance = % of common variance explained by factor solution, h^2 = communalities, λ = standardized factor loadings. The items in **bold** are the final 12 items. The items without bold were included when originally presented to teachers.

4.1.4. Cognitive interviews

The next phase of the scale development involved cognitive interviews with the target participants, teachers. The goal of this phase was to ensure that the 18 self-efficacy items corresponded to actual perceptions and experiences of teachers who have worked with students with ASD. This step helped to provide evidence about the response processes for teachers who take the self-efficacy measure (Willis, 1999).

Certified teachers ($n = 10$) were recruited through a convenience sample. Face-to-face cognitive interviews were conducted by a trained interviewer and included introductory verbal scripts and relevant scripted probes for each item (Willis & Boeije, 2013). All interview sessions were transcribed. Verbal probing helped to determine how teachers comprehend the items and respond to them. Based on teachers' understandings of the 18 items, 4 items were removed, resulting in a remaining 14-item instrument that was given to teachers. The final 12-item Teacher Self-Efficacy for Students with Autism Scale (TSEAS) resulted following removal of two final items (item 13 & item 14) following the analyses. The final two items were removed after examining their content or contribution to the construct of self-efficacy for teaching students with ASD. The final 12 items are bolded in Table 1.

4.1.5. Participants

The targeted survey participants for Study 1 were teachers of students ages 5–18 who were working in the US. Respondents were recruited through snowball sampling in which known teachers and administrators were asked to recruit additional members through social media, listservs, public e-mail lists, and word-of-mouth. General education and special education teachers were invited to participate, but must have taught an individual with ASD to participate.

Consenting participants were 120 teachers ($M_{\text{age}} = 37.81$, $SD = 12.18$; 81% female) with a range of experience across age groups and subjects. Teachers indicated their primary teaching role as elementary education (38%), teacher of other subjects (e.g., physical education, music, or art; 30%), high school (20%), and special education (12%). Self-reports indicated that 92% were White, 3% were Black or African American, 2% were Asian or Asian American, and 3% self-identified as another ethnic group.

4.1.6. Measures

At the beginning of the survey, teachers were asked to report their gender, primary teaching subject, experience working with students with ASD, certification in Special Education, race, grade level, school context, years' experience, highest level of education achieved, and age.

Teachers' self-efficacy for teaching students with ASD, the primary variable of interest, was assessed with the TSEAS (see Table 1). Coefficient omega (ω ; McDonald, 1999) was used to offer a robust estimation of the score reliability, $\omega = .91$.

General *teaching self-efficacy* was assessed with the Teacher Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001), a 12-item measure assessing general self-efficacy for teaching all types of students. A sample item for this instrument reads, "How much can you do to help your students value learning?" This is different from the student-specific self-efficacy measure in that it does not ask a teacher to consider a specific student group or type of student. The scale features a 9-point Likert-type response format ranging from 1 (*Nothing*) to 9 (*A great deal*) with $\omega = .95$. The factor structure of this measure has been shown to reflect both a three-factor structure and a unidimensional solution (Tschannen-Moran & Woolfolk-Hoy, 2001). An exploratory factor analysis of the TSES in the current sample demonstrated that a unidimensional solution exists with all loadings above .53.

Job satisfaction was measured using the 14-item Brayfield Rothe Job Satisfaction Index (Brayfield & Rothe, 1951), modified by (Warner, 1973), and included a response format ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) with $\omega = .98$. A sample item for this instrument reads, "I like my job better than the average worker does." This instrument has been used to measure feelings and

emotions related to a participant’s current teaching position (Voris, 2011). An exploratory factor analysis of this scale suggested that a unidimensional solution exists for the current sample. All loadings were above .53.

Self-regulation was measured with the 10-item Self-Regulation Scale (SRS; Schwarzer, Diehl, & Schmitz, 1999), which used a response format ranging from 1 (Not at all true) to 4 (Exactly true) with $\omega = .95$. A sample item for this instrument reads, “If an activity requires a problem-oriented attitude, I can control my feelings.” An exploratory factor analysis of the self-regulation scale for the current sample first suggested a two-factor structure; however, the second factor was comprised of negatively worded items and thus was declared an artifact. The negative items were not dropped, and a unidimensional solution was determined to represent the underlying structure of self-regulation within this sample.

4.1.7. Procedure

An anonymous link was shared with teachers, which directed them to an online survey. After consenting to participate, teachers watched a three-minute introductory video to acquaint them with a definition of ASD (Sadiq, 2014). This was to ensure that all participants were prompted to think of students with ASD with an accurate description of the diagnosis in mind (Sadiq, 2014). Participants were then asked to complete the self-report measures described above. All measures and items appeared in a randomly assigned order to prevent scale ordering effects and to minimize item ordering effects. The mean survey completion time was 14.41 min. At the end of the survey, the teachers were thanked for their participation and the results were automatically recorded. Participants had the option of refusing to respond to any question. No incentive was offered to participants. The data collection period lasted three months.

4.2. Analyses and results

Two major analyses were conducted to evaluate the scores derived from the TSEAS and answer the two primary research questions. An initial inspection of the polychoric correlation matrix (based on the robust weighted least squares estimator in Mplus, WLSMV) showed that all correlations were above .30 (Henson & Roberts, 2006) and the Kaiser-Meyer-Olkin measure of sampling was .85, which is above the recommended value of .50 (Williams, Brown, & Onsmann, 2012). Also, Bartlett’s test of sphericity was statistically significant (683.84, $p < .001$). Based on these initial analyses of the 14 items, it was determined that the TSEAS can appropriately be explored using an exploratory factor analysis (EFA). When conducting any type of factor analysis, a larger sample is always better (DeVellis, 2003; MacCallum, Widaman, Zhang, & Hong, 1999). However, research has shown that it is acceptable to conduct a factor analysis with samples as small as 100 (MacCallum et al., 1999; MacCallum, Widaman, Preacher, & Hong, 2001). Therefore, the current sample was considered sufficient for the EFA.

Initial communalities from the EFA were all above .30, except for Items 13 and 14, confirming that most items shared common variance with each other. Items 13 and 14 were flagged for further examination and analyses continued. Findings from the scree procedure (Cattell, 1966) and Horn’s (1965) parallel analysis both indicated a single factor solution could represent the 14 TSEAS items in this sample. In addition, the first-to-second eigenvalue ratio was approximately 5:1 (6.03/1.05), which suggests that the instrument is approximately unidimensional (Lord, 1980). Factor pattern loadings for the unidimensional solution indicated that all items loaded heavily onto Factor 1 (factor loadings greater than .50), except for Items 13 and 14. We believe Item 13 may have been written too broadly, as was suggested during our expert review phase. Item 14, specifically, asks teachers to respond to their self-efficacy for collaboration with a Special Education teacher. We believe that conceptually, this item may not be appropriate as collaboration with a Special Education teacher may be unique to only some teachers experiences. In addition, their self-efficacy for collaboration does not specifically relate to their ability to work with a student with ASD. As a combined result of the empirical and conceptual evidence, these two items were removed from the solution to arrive at the 12-item TSEAS (see Table 1). This general factor from the EFA was meaningfully labeled, “Self-Efficacy for Teaching Students With ASD.”

To answer the second research question, we used a correlational analysis to provide sources of convergent and discriminant evidence of validity. As each of the scales consists of multiple items and each is assumed to be explained by a latent variable (e.g., TSEAS, teacher self-efficacy, job satisfaction, and self-regulation), each was treated as a latent variable. Values therefore reflect latent

Table 2
Observed and Latent Variable Correlations for Variables in Study 1 (N = 120) in the United States Sample.

Variable	Teacher Self-Efficacy for Autism Scale		Teacher Sense of Efficacy Scale		Self-Regulation Scale	
	Correlation	95% CI	Correlation	95% CI	Correlation	95% CI
Teacher Sense of Efficacy Scale	.44 (.46)	[.19, .61] [.37, .62]				
Self-Regulation Scale	.28 (.33)	[.09, .45] [.23, .51]	.12 (.30)	[−.07, .30] [.16, .31]		
Job Satisfaction Scale	.20 (.26)	[−.04, .41] [.26, .37]	.25 (.18)	[.05, .45] [.17, .42]	.31 (.32)	[.13, .50] [.34, .41]

Note. Observed (raw) score Pearson correlation coefficients are presented first without (). Latent variable correlations are presented in (). Corresponding 95% bootstrap corrected confidence intervals are reported in [] to document statistical significance. Bootstrap corrected confidence intervals were constructed using 500 Bootstrap samples.

variable correlations between the measurement models that represent each construct (see Table 2). As predicted, scores from the TSEAS were positively related to scores derived from the Teacher Sense of Efficacy Scale ($r = .46$, 95% CI [.37, .62]). Scores on the TSEAS and significantly related to self-regulation scores ($r = .33$, 95% CI [.23, .51]) and to job satisfaction scores ($r = .26$, 95% CI [.34, .41]). Scores on the Teacher Sense of Efficacy Scale likewise demonstrated a significant correlation with self-regulation ($r = .30$, 95% CI [.23, .51]) and job satisfaction scores ($r = .18$, 95% CI [.26, .37]). Scores ranged from 18 to 48, and the mean score for the 12-item TSEAS was 37.26 ($SD = 6.26$).

4.3. Discussion

The purpose of this study was to develop a new teacher self-efficacy scale that would be appropriate for assessing the self-efficacy of teachers who teach students with ASD. It is important to determine whether teachers respond to a measure of self-efficacy for teaching students with ASD differently than they do to a measure assessing their self-efficacy for teaching in general. Information regarding a teacher's beliefs about their own competencies for a specific group of students can lead to improvements in practice and methods as teacher self-beliefs are likely to have significant impact on teachers' decisions (Pajares, 1992).

Items comprising the TSEAS were based on a rigorous scale development process including a current teacher self-efficacy scale, expert reviews in the area of ASD and teacher self-efficacy, and cognitive interviews with teachers. The final set of items reflects these combined efforts. Results of an EFA provided evidence for the measure's unidimensionality. This means that a single construct underlies the items contained within the TSEAS, which is consistent with findings reported in general teaching self-efficacy research (Tschannen-Moran & Woolfolk Hoy, 2001). These results allow for total scores to be reported from the TSEAS, and that all items represent a single construct (i.e., self-efficacy for teaching students with ASD). A unidimensional solution means that teachers are considering all factors and dimensions of teaching their students with ASD in a consistent way. For practitioners or researchers that understand the complexity of teaching a student with ASD, this unidimensional solution might seem problematic. The TSEAS was designed to address various elements of teaching students with ASD in a general way in order to successfully determine the self-efficacy of all teachers who work with students with ASD – not only those who understand the complexity of ASD. Therefore, the unidimensional solution is reflective of intended interpretation of the scale, and future scale development work could help understand more about the multidimensionality of teaching a student with ASD. Further validation with larger and more diverse samples will help to support this finding, and use of a confirmatory factor analysis is suggested in the future. In addition, researchers might wish to use measurement invariance or similar techniques to understand the factor structure that exists for teachers who have various experience levels or training.

Collecting data from additional measures permitted us to evaluate the relationship between TSEAS scores and variables hypothesized to be related or unrelated to the latent construct. As expected, the TSEAS was positively correlated with general teacher self-efficacy. The correlation of .46 indicates some differentiation but also suggests that the scales describe related but unique constructs. That is, teachers may feel confident in their general teaching abilities, but they might feel differently when considering how well they are able to teach students with ASD. A high-to-perfect correlation would indicate full overlap between the general measure of teacher self-efficacy and the TSEAS (i.e., that teachers make no distinction when judging their capabilities for teaching in general and for teaching their students with ASD). But we found no extreme measurement redundancy.

We hypothesized that teacher self-efficacy would be positively related to self-reported job satisfaction. Our findings suggest that teachers' perceived efficacy for teaching students with ASD was modestly associated with higher reports of job satisfaction. Conversely, teachers with lower self-efficacy for teaching students with ASD report lower job satisfaction. This relationship makes sense. Teachers who feel capable of teaching a challenging group of learners also report being satisfied at work, and vice versa. More research is needed to examine any potential causal relationships more fully.

We also found that self-regulation was positively correlated with the TSEAS and with teachers' general self-efficacy, as expected. The magnitude of the correlation was strongest for self-regulation and the TSEAS. This finding suggests that teachers who demonstrate higher self-efficacy for teaching students with ASD may also report a higher degree of self-regulation in general. Indeed, teaching students with ASD may require a higher degree of self-regulatory control than does teaching students in general. Research investigating the interplay of self-control variables, like self-regulation, and self-efficacy can be informative in teacher training programs that consider both personal factors and knowledge factors when preparing teachers for working with any student, and particularly for working with students with ASD.

5. Study 2

Evidence from Study 1 suggests that the TSEAS can be used with teachers in the U.S. context who come from a variety of backgrounds. The primary purpose of Study 2 was to extend this evidence by investigating evidence for the convergent and discriminant validity using latent variable correlation analyses of TSEAS scores among teachers in Australia. Further factor analyses were not completed due to the limitations of sample size.

5.1. Method

The targeted survey participants for Study 2 were teachers in Australia who taught at least one student with autism age 5 to 18. Respondents were recruited through snowball sampling in which known teachers and administrators were asked to recruit additional members through social media, listservs, public e-mail lists, and word-of-mouth. To ensure that teachers worked with at least one

Table 3
Observed Variable Correlations for Variables in Study 2 (N = 85) in the Australian Sample.

Variable	Teacher Self-Efficacy for Autism Scale		Teacher Sense of Efficacy Scale		Self-Regulation Scale	
	Correlation	95% CI	Correlation	95% CI	Correlation	95% CI
Teacher Sense of Efficacy Scale	.12	[−.07, .32]				
Self-Regulation Scale	.34	[.13, .52]	.19	[−.07, .31]		
Job Satisfaction Scale	.21	[−.02, .42]	.28	[.07, .46]	.48	[.28, .61]

Note. Observed (raw) score Pearson correlation coefficients are presented. Corresponding 95% bootstrap corrected confidence intervals are reported in []. Bootstrap corrected confidence intervals were constructed using 500 Bootstrap samples. Due to sample size constraints in study 2, latent variable correlations could not be accurately estimated and therefore only observed correlations could be estimated.

student with autism, special education teachers were targeted. The sample was therefore collected from Special Development School teachers. In Australia, Special Development Schools are schools that are specially designed to educate individuals with disabilities.

Consenting participants were 85 special educators in Australia whose mean age was 45.31 years ($SD = 14.94$; 94.1% female). Teachers indicated their primary teaching role as elementary education (20%), teacher of other subjects (e.g., physical education, music, or art; 34%), high school (32%), and special education (14%). Self-reports indicated that 41% were White, 4% were Black or African American, 4% were Aboriginal or Torres Straight Islander, 11% were Asian or Asian American, and 40% declined to answer this item (missing data). Participants completed an online survey on which they rated their self-efficacy for teaching students with ASD ($\omega = .96$), general teaching self-efficacy ($\omega = .95$), self-regulation ($\omega = .96$), and job satisfaction ($\omega = .76$). Additional measures were also included, but are not the focus of this study. Scales and items were presented in randomized order. The measures analyzed for study 2 were identical to those used in study 1.

5.2. Results

Pearson correlations among the study variables were estimated to examine the relationship between scores on the TSEAS and general teacher self-efficacy, job satisfaction, and self-regulation (see Table 3). Scores from the TSEAS had a weak positive correlation with scores derived from the TSES ($r = .12$, 95% CI [−.07, .32]). As expected, scores on the TSEAS were positively related to self-regulation ($r = .34$, 95% CI [.13, .53]) and job satisfaction scores ($r = .21$, 95% CI [−.02, .42]). Scores on the TSES likewise demonstrated a positive correlation with scores from the job satisfaction measure ($r = .28$, 95% CI [.07, .46]) but a nonsignificant correlation with scores from the self-regulation scale ($r = .19$, 95% CI [−.07, .31]). Scores from the self-regulation scale were moderately correlated with scores from the job satisfaction scale ($r = .48$, 95% CI [.28, .61]). Scores ranged from 19 to 48, and the mean score for the 12-item TSEAS was 30.67 ($SD = 9.56$).

5.3. Discussion

The pattern of results from Study 2 generally mirrored those from Study 1; however, the magnitude of effects differed. The magnitude of the correlation between self-efficacy for teaching students with ASD and general teaching self-efficacy was considerably weaker in the Australian sample than in the U.S. sample. In Study 1, there was a moderate, positive relationship and in Study 2, a weak positive relationship between scores from the TSEAS and scores from the TSES. This could be because only special education teachers participated in the Australian context, and potentially points to a difference between teachers who primarily work with individuals with disabilities in the Australian sample and teachers who work in an inclusive environment in the United States sample. It would be important to compare a Special Education sample in the US context to the Australian Special Education teachers to compare a more similar group of teachers. This comparison is beyond the scope of this project due to sample size limitations, but is recommended for future research.

What is clear, however, is that teachers in both studies responded differently to the scale designed to ask teachers about a specific group of students (TSEAS) when compared to the scale that asks about general teacher self-efficacy. In other words, teaching students with autism and teaching students in general are seen as two different constructs in both studies. This conclusion demonstrates the need for a researcher to use a student-specific scale and points to the importance of a teacher self-efficacy scale that is specific to teaching students with autism. A general teacher self-efficacy scale will not be as informative nor as sensitive as one that asks a teacher specifically about a student they are working with.

In Australia, scores from the general teaching self-efficacy measure reflected teachers' evaluations of their own capabilities to manage, instruct, and engage students that were less similar when associated with their perceived capabilities for working with students with ASD. This finding has implications for research and practice. For example, traditional teaching self-efficacy measures may not assess certain complexities of the teaching task when it involves specific learners. When preparing teachers for the diverse students they will encounter, teacher preparation programs should consider the sources that underlie a sense of efficacy for teaching.

6. Limitations and future research

Several limitations in both investigations are worth noting, the majority of which relate to the challenges of relying on self-report

instruments. These measurement limitations include acquiescence, extreme responding, and socially desirable responding (DeVellis, 2003). Self-report measures like the TSEAS come with a potential susceptibility of social desirability, or a tendency for teachers to respond according to what they think is socially acceptable. We examined item response frequencies to investigate this possibility, and results showed that certain response categories were not being used consistently. Research has shown that “when people err in their self-judgments, their efficacy beliefs typically exceed their behavior” (Bandura, 1997, p. 46). This could mean that the self-efficacy ratings obtained in this study are artificially high. Using multiple means (e.g., vignettes, response to video scenarios, projective testing, interviews) to triangulate teachers’ self-efficacy beliefs might render a more complete assessment.

Our current studies also lacked a random sampling approach and therefore might have over- (or under-) recruited teachers with certain self-efficacy profiles. Study 1 used a sample size of 120 teachers and study 2 used a sample of 85 teachers. When compared to other studies of similar nature in the field of special education, this reflects an appropriate sample size, as soliciting responses from teachers is a challenging task. However, to conduct in-depth item analyses (including additional factor analyses and measurement invariance tests), which will increase confidence in parameter estimates of the inferences made, researchers should aim for larger samples when possible. Alternative response formats (i.e., ranking or forced-choice formats) should also be considered to maximize differentiation among teachers in their reports of self-efficacy. Therefore, it is suggested that future studies focus on diverse methodologies and experimental research to expand the construct and inform researchers and practitioners on the psychometric aspects of this teacher self-efficacy scale.

Finally, this instrument represents a student-specific measure assessing self-efficacy for teaching students with ASD. We asked teachers to consider one student when answering the self-efficacy items in an attempt to get a consistent picture of their own confidence in working with one student with ASD. Asking teachers to consider more than one student with ASD may have resulted in teachers’ inability to answer items consistently. However, limitations of this decision exist. Our results represent teachers’ judgments of their own self-efficacy for working with the one student with ASD they considered. In the future, we hope to collect data on the specific student under consideration – in hopes to correlate the severity of ASD with their self-reported level of self-efficacy. This data was not collected in the current study, and therefore represents a limitation.

Following further attempts to provide evidence for validity in diverse samples, this scale can be used to help school administrators know more about their teachers’ beliefs specific to their students with ASD. If school administrators were to use this scale with their teachers, they could then design interventions and support for areas where teachers reported weakness or wavering beliefs. This instrument is not meant to be used a screener or tool to identify when teachers are good or bad at teaching students with autism; instead, the scale can be used to help teachers know more about what areas they believe they are competent and where improvements can be made. Knowing previous literature identified links between teacher self-efficacy and behavior, student achievement, and teacher factors like burnout (Zee et al., 2016), this construct can be a preventative measure used to address some of these factors with teachers who work with this population of students. As teacher self-efficacy has been previously established as an important factor to consider when holistically looking at a teacher’s effectiveness, this scale can help to address concerns specific to working with students with ASD. The instrument is not meant to be a qualifier for what can determine a “good” or “bad” teacher, but instead, a means of understanding what teachers believe knowing the impact it can have on their teaching and their students achievement.

References

- American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME) (2014). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman and Company.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares, & T. Urdan (Vol. Eds.), *Self-efficacy beliefs of adolescents: Vol. 5*, (pp. 307–337). Greenwich, CT: Information Age Publishing.
- Bensen, J., & Clark, F. (1982). A guide for instrument development and validation. *The American Journal of Occupational Therapy*, 36, 789–800. <https://doi.org/10.5014/ajot.36.12.789>.
- Bong, M. (2005). Within-grade changes in Korean girls’ motivation and perceptions of the learning environment across domains and achievement levels. *Journal of Educational Psychology*, 97, 656–672. <https://doi.org/10.1037/0022-0663.97.4.656>.
- Boujut, E., Popa-Roch, M., Palomares, E. A., Dean, A., & Cappe, E. (2017). Self-efficacy and burnout in teachers of students with autism spectrum disorder. *Research in Autism Spectrum Disorders*, 36, 8–20.
- Brayfield, A. H., & Rothe, H. F. (1951). An index of job satisfaction. *Journal of Applied Psychology*, 35, 307–311. <https://doi.org/10.1037/h0055617>.
- Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers’ self-efficacy beliefs as determinants of job satisfaction and students’ academic achievement: A study at the school level. *Journal of School Psychology*, 44, 473–490. <https://doi.org/10.1016/j.jsp.2006.09.001>.
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, 1(2), 245–276. https://doi.org/10.1207/s15327906mbr0102_10.
- Centers for Disease Control and Prevention (2015). *Autism Spectrum Disorder (ASD)*. Retrieved from <http://www.cdc.gov/ncbddd/autism/facts.html>.
- DeVellis, R. F. (2003). *Scale development: Theory and applications*. Los Angeles, CA: Sage.
- Emmer, E. T., & Hickman, J. (1991). Teacher efficacy in classroom management and discipline. *Educational and Psychological Measurement*, 51(3), 755–765.
- Guo, Y., Dymia, J. M., Pelatti, C. Y., & Justice, L. M. (2014). Self-efficacy of early childhood special education teachers: Links to classroom quality and children’s learning for children with language impairment. *Teaching and Teacher Education*, 39, 12–21. <https://doi.org/10.1016/j.tate.2013.11.005>.
- Guskey, T. R., & Passaro, P. D. (1994). Teacher efficacy: A study of construct dimensions. *American Educational Research Journal*, 31, 627–643. <https://doi.org/10.3102/00028312031003627>.
- Hartmann, E. (2012). A scale to measure teachers’ self-efficacy in deaf-blindness education. *Journal of Visual Impairment & Blindness*, 106(11), 728–738.
- Henson, R. K., & Roberts, R. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological Measurement*, 66(3), 393–416. <https://doi.org/10.1177/0013164405282485>.
- Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30, 179–185. <https://doi.org/10.1016/j.jrurstud.2015.12.005>.
- Klassen, R. M., Al-Dhafri, S., Mansfield, C. F., Purwanto, E., Siu, A., Wong, M. W., et al. (2012). Teachers’ engagement at work: An international validation study. *Journal of Experimental Education*, 80, 1–20. <https://doi.org/10.1080/00220973.2012.678409>.
- Klassen, R. M., Bong, M., Usher, E. K., Ching, W. H., Huan, V. S., Wong, I. Y. F., et al. (2009). Exploring the validity of a teachers’ self-efficacy scale in five countries. *Contemporary Educational Psychology*, 34, 67–76. <https://doi.org/10.1016/j.cedpsych.2008.08.001>.
- Klassen, R. M., Tze, V. M. C., Betts, S. M., & Gordon, K. A. (2011). Teacher efficacy research 1998–2009: Signs of progress or unfulfilled promise? *Educational Psychology*

- Review, 23, 21–43. <https://doi.org/10.1007/s10648-010-9141-8>.
- Kline, P. (1986). Making tests reliable II: Personality inventories. In P. Kline (Ed.). *A handbook of test construction: Introduction to psychometric design* (pp. 59–76). London, United Kingdom: Methuen.
- Lord, F. M. (1980). *Applications of item response theory to practical testing problems*. New York: Erlbaum Associates.
- MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, 4, 84–99. doi:10.82989X/99/4300.
- MacCallum, R. C., Widaman, K. F., Preacher, K. J., & Hong, S. (2001). Sample size in factor analysis: The role of model error. *Multivariate Behavioral Research*, 36, 611–637. https://doi.org/10.1207/S15327906MBR3604_06.
- Mastropieri, M. A., & Scruggs, T. E. (2014). *The inclusive classroom*. Boston, MA: Pearson.
- McDonald, R. P. (1999). *Test theory: A unified treatment*. Mahwah, N.J.: Erlbaum Associates.
- Pajares, F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62, 307–332. <https://doi.org/10.3102/00346543062003307>.
- Pajares, F., & Usher, E. L. (2008). Self-efficacy, motivation, and achievement in school from the perspective of reciprocal determinism. In M. L. Maehr, S. A. Karabenick, & T. C. Urdan (Vol. Eds.), *Advances in motivation and achievement*: 15, (pp. 391–423). United Kingdom: Emerald Group Publishing Limited. [https://doi.org/10.1016/S0749-7423\(08\)15012-9](https://doi.org/10.1016/S0749-7423(08)15012-9).
- Ruble, L. A., Toland, M. D., Birdwhistell, J. L., McGrew, J. H., & Usher, E. L. (2013). Preliminary study of the autism self-efficacy scale for teachers (ASSET). *Research in Autism Spectrum Disorders*, 7(9), 1151–1159. <https://doi.org/10.1016/j.rasd.2013.06.006>.
- Ruble, L., Usher, E., & McGrew, J. (2011). Preliminary investigation of the sources of self-efficacy among teachers of students with autism. *Focus on Autism and Other Developmental Disabilities*, 26, 67–74. <https://doi.org/10.1177/1088357610397345>.
- Sadiq, A. (2014). *What is autism?* [Video file]. Retrieved from <https://www.youtube.com/watch?v=hRmNnmM5e0M>.
- Schwarzer, R., & Hallum, S. (2008). Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses. *Applied Psychology: An International Review*, 57, 152–171. <https://doi.org/10.1111/j.1464-0597.2008.00359.x>.
- Schwarzer, R., Diehl, M., & Schmitz, G. S. (1999). *Self-regulation scale*. Retrieved September 21, 2015 from <http://www.fu-berlin.de/gesund/skalen>.
- Segall, M. J., & Campbell, J. M. (2014). Factors influencing the educational placement of students with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 8(1), 31–43. <https://doi.org/10.1016/j.rasd.2013.10.006>.
- Smith, E. V., Jr., Wakely, M. B., DeKruif, R. E. L., & Swartz, C. W. (2003). Optimizing rating scales for self-efficacy (and other) research. *Educational and Psychological Measurement*, 63, 369–391. <https://doi.org/10.1177/0013164403063003002>.
- Thorndike, R. M., & Thorndike-Christ, T. (2010). *Measurement and evaluation in psychology and education*. Boston, MA: Prentice Hall.
- Toland, M. D., & Usher, E. L. (2015). Assessing mathematics self-efficacy: How many categories do we really need? *Journal of Early Adolescence*, 36(7), 932–960. <https://doi.org/10.1177/0272431615588952>.
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17, 783–805. [https://doi.org/10.1016/S0742-051X\(01\)00036-1](https://doi.org/10.1016/S0742-051X(01)00036-1).
- Voris, B. C. (2011). *Teacher efficacy, job satisfaction, and alternative certification in early career Special Education teachers* (Doctoral dissertation). Retrieved from <http://uknowledge.uky.edu/gradschool/diss/159>.
- Warner, P. D. (1973). *A Comparative study of three patterns of staffing within cooperative extension organization and their association with organizational structure, organizational effectiveness, job satisfaction and role conflict*. Unpublished doctoral dissertation. Columbus, OH: Department of Psychology, Ohio State University Unpublished.
- White, M. L., Smith, J. D., Smith, T. E. C., & Stodden, R. (2012). Autism spectrum disorders. In D. Zager, M. L. Wehmeyer, & R. L. Simpson (Eds.). *Educating students with autism spectrum disorders* (pp. 3–12). New York, NY: Routledge.
- Williams, B., Brown, T., & Onsmann, A. (2012). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, 8, 1–12.
- Willis, G. B. (1999). *Cognitive interviewing: A "how to" guide*. Research Triangle Institute Retrieved from <http://www.uiowa.edu/~c07b209/interview.pdf>.
- Willis, G. B., & Boeije, H. (2013). Reflections on the cognitive interviewing reporting framework: Efficacy, expectations, and promise for the future. *Methodology: European Journal of Research Methods for the Behavioral and Social Science*, 9, 123–128. <https://doi.org/10.1027/1614-2241/a000074>.
- Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, 1–35. <https://doi.org/10.3102/003>.
- Zee, M., Koomen, H. M. Y., Jellesma, F. C., Geerlings, J., & de Jong, P. F. (2016). Inter-and intra-individual differences in teachers' self-efficacy: A multilevel factor exploration. *Journal of School Psychology*, 55, 39–56. <https://doi.org/10.1016/j.jsp.2015.12.003>.