# The Classroom Practice Inventory: Psychometric evaluation of a rating scale of intervention practices for children with autism spectrum disorder[☆]

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## ARTICLE INFO

## ABSTRACT

The Classroom Practice Inventory (CPI) was developed as a tool to provide descriptive information about the practices used in classrooms to address the developmental needs of children with autism spectrum disorder (ASD). Data from a multi-site study examining the outcomes for preschool students with ASD served in three types of classroom models indicate that the CPI produces reliable and valid assessments of practices used in classrooms. Items on the CPI can be used to discriminate among classroom models and can be used to provide descriptive information about classrooms following a prescribed comprehensive treatment model as well as those providing an eclectic model of services. Implications for the future use of the CPI are discussed.

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Many young children with autism spectrum disorder (ASD) are served in preschool programs and teachers in these programs report using a variety of educational strategies and intervention practices (Hess, Morrier, Heflin, & Ivey, 2008; Stahmer, Collings, & Palinkas, 2005). Some programs adhere to a specific comprehensive treatment model (CTM; e.g., TEACCH Autism Program, Learning Experiences and Alternative Program for Preschoolers and their Parents, LEAP, see Odom, Boyd, Hall, & Hume, 2010 for additional examples) designed to address the broad developmental needs of children with ASD. Other programs that use a more "eclectic" model of services, combining intervention practices from many models or resources rather than following a specific intervention framework (Howard, Sparkman, Cohen, Green, & Stanislaw, 2005). The unique characteristics and needs of children with ASD often necessitate the individualization of educational settings and services to address the varying developmental needs of children with this diagnosis (Iovannone, Dunlap, Huber, & Kincaid, 2003; Stahmer et al., 2005b). Recently, researchers (i.e., Odom, Hume, Boyd, & Stabel, 2012; Stahmer, Schreiman, & Cunningham, 2010) have suggested that combining treatment approaches to support this individualization may be the most effective approach to address the varied needs and characteristics of students with ASD.

There has been, however, little research about these combined treatment approaches, often termed "eclectic," "business as usual (BAU)," or "non-model specific" to date (Howard et al., 2005). An eclectic approach has not been clearly

defined in practice or in research (Dillenburger, 2011; Odom et al., 2012), but has been used frequently as a contrast to comprehensive treatment model programs. The few existing studies addressing these models have shown conflicting evidence about effectiveness of eclectic models with some studies finding that children in eclectic models did not make developmental gains as quickly as those in intensive behavior treatment (IBT) models despite similar dosage and intensity (Eikeseth, Smith, Jahr, & Eldevik, 2002; Howard et al., 2005). In contrast, recently Boyd et al. (2014) compared the effects of two comprehensive treatment models (TEACCH and LEAP) and non-model specific (or eclectic) classrooms on various developmental and behavioral outcomes for young children with ASD (Boyd et al., 2014). Results indicated that children in all three types of programs made significant and similar gains: However, there were no differential gains across classroom types. This study indicated that high-quality eclectic models, when carefully defined and selected, can be efficacious for this population.

While individualization of programs and practices is likely beneficial for young children, it presents challenges for researchers studying the efficacy of such programs, because operationally defining and accurately capturing the types of practices used, and with which student, is difficult (Odom, Boyd, Hall, & Hume, in press). Supplemental educational practices may be specified by the comprehensive treatment model (e.g., the use of visual supports within the TEACCH program), but even classrooms adhering to one model may adapt other methods and strategies as needed to address the developmental needs of children with ASD (Boyd et al., 2014). There is often overlap between practices used as part of a broader intervention program or model and those used in eclectic settings (Odom et al., 2012). Additionally, many practices are commonly combined: for example using both discrete trial strategies and naturalistic interventions (Fava et al., 2011). If practice components used in classrooms are not measured or reported, it can be difficult to draw conclusions about the effectiveness of these approaches because practices may be mixed and combined on top of stated intervention models. Furthermore, it can be difficult to draw conclusions about the effectiveness of eclectic models versus comprehensive treatment models when the exact practices used within each are not described or measured (Durlak & DuPre, 2008; Reichow, Barton, Boyd, & Hume, 2012). While fidelity or implementation measures are critical to gather data on the intervention being implemented, such measures may not capture what else is happening in the classroom outside the scope of that intervention. Researchers may need an additional way to describe ongoing, complementary classroom practices (e.g., those in place in eclectic classrooms or those used in classrooms using CTMs), and one starting place is to have teachers self-identify the specific educational practices being implemented.

The comprehensive treatment models study team developed the Classroom Practice Inventory (CPI; TEACCH/LEAP project team, 2007) for use in their study of CTMs and non-model specific classrooms to help provide further descriptions of practices used in study classrooms. This tool was and can be used to gather information about practices used in classrooms and to describe and define eclectic classrooms. While a number of questionnaires have been used to gather classroom practice information (e.g., Hume, Bellini, & Pratt, 2005; Hess et al., 2008), no existing measure of classroom practices is psychometrically validated as is recommended (Hume et al., 2011), and no measure, to our knowledge, has been used in the context of a study examining the efficacy of school-based classroom practices.

The purpose of this study was to analyze the reliability and validity of a classroom practices measure, the CPI. The measure was used in an examination of the relative efficacy of two CTMs (i.e., TEACCH and LEAP) and non-model-specific (or eclectic) classrooms, and has future utility in similar treatment research. The measure development is consistent with current calls in the literature to better define and describe the eclectic condition often used in treatment efficacy studies (Reichow et al., 2012; Smith et al., 2007). Potentially, such data can be used to better understand both mediators and moderators of implementation in treatment research.

## 1. Research questions

The specific research questions are (1) does the CPI measure produce reliable scores as judged by the assessment of internal consistency, test–retest reliability, and inter-rater agreement? and (2) does the CPI produce valid scores as judged by its ability to discriminate between classrooms employing CTMs and eclectic practices?

## 2. Method

Three primary steps were completed in the development and psychometric validation of the CPI. Though the CPI was used to gather data related to supplemental classroom practices rather than fidelity data, these three steps mirror the recommendations of researchers designing fidelity of implementation measures for use in intervention studies, and mirror the steps the larger project also followed to develop its fidelity measures (described in Hume et al., 2011; Mowbrey, Holter, Teague, & Bybee, 2003). The first step is to design the measure based on expert consensus and explicit description as well as developing indicators that assist in anchoring points on rating scales (Mowbrey et al., 2003). This step is described in Section 2.1. The second step is to collect data to measure the indicators. This step, which includes self-report by classroom teachers at the beginning and end of the school year, is described in Section 2.2.1. The third step is to examine the indicators in terms of their reliability as well as validity (Moncher & Prinz, 1991). This final step is addressed in Sections 2.3 and 3.

## 2.1. Measures and measure development

Project staff associated with the comprehensive treatment models project, and who have expertise in classroom interventions for young children on the autism spectrum, designed the CPI. The original version included 10 commonly used classroom practices (per Hess et al., 2008). Teachers could indicate whether they used the practice, what percentage of time the practice was in use, and how many hours of professional consultation was received for each practice monthly. This version was reviewed by staff members with expertise in autism and classroom intervention, including educators, psychologists, graduate students, and research scientists, at the Frank Porter Graham Child Development Institute, University of Miami, and University of Colorado, Denver. The instrument was revised based on expert recommendations and a review of comprehensive treatment models (Odom, Boyd, et al., 2010). This revision led to the inclusion of (a) more practices [per the National Professional Development Center on ASD's list of evidence based practices (http:// autismpdc.fpg.unc.edu/content/briefs)]; (b) a more accurate method for staff to report on the frequency of practice use (number of students that receive the practice and how regularly practice is used each week, rather than a percentage of the week which was deemed too difficult), and (c) explicit definitions of each practice to increase accuracy of teacher reporting. The revised version was circulated again. After final edits, the measure included 24 items across 10 domains (behavioral approaches, developmental approaches, additional approaches, communication strategies, environmental supports, technology supports, social supports, behavior supports, other approaches, and curriculum). Each item included an explicit definition derived from the sources listed above and space was provided so teachers could write in additional approaches and/or curricula used. Teachers rated their use of each approach/strategy/curriculum on a five-point Likert scale: 0 = I don't ever use this practice with any of my students, 1 = I occasionally use this practice with some of my students (fewer than half), 2 = I occasionally use this practice with most of my students (more than half), 3 = I use this practice frequently with some of my students (fewer than half), 4 = I use this practice frequently with most of my students (more than half). The full measure can be found in the Appendix.

## 2.2. Procedures

### 2.2.1. Data collection

After measure development, the CPI was given to teachers participating in a multi-site study examining the outcomes for preschool students on the autism spectrum served in either a comprehensive treatment model such as TEACCH and LEAP, or in an eclectic program. For a complete description of the broader study, recruitment procedures, and comprehensive treatment models, see Boyd et al. (2014). The broader study, which included the use of the CPI, received approval form the university's Institutional Review Board and teachers provided consent before participation/completion of the CPI and other measures. Participating classroom teachers received and completed the CPI at the beginning and end of the school year (or T1 and T2). T1 was administered typically within the first 6 weeks of students enrolling in the classroom. The CPI is a self-report measure, with practitioners being instructed to select a response that most accurately reflects how often they use the practice/strategy/curricula during an average school day. For the current study, the CPI was completed independently by teachers and returned to research staff, all Masters or Ph.D. level staff and research assistants with backgrounds in special education or psychology. This process was repeated at T2, which typically occurred during the last 6 weeks of the school year.

### 2.2.2. Participants

A total of 74 teachers were enrolled in the study (25 TEACCH, 22 LEAP and 27 BAU). Each teacher was enrolled in the study for the duration of one school year. Relevant demographic information on schools, classrooms and teachers can be found in Table 1. Teachers/classrooms were enrolled in the study if they met the following inclusion criteria: (1) all classrooms had to operate within the public school system; (2) teachers had to be certified to teach in their respective state; (3) TEACCH and LEAP teachers must have attended a formal training, either conducted by personnel directly affiliated with those programs or conducted by others who had been formally trained; (4) teachers must have been teaching in their respective classroom type for at least 2 years prior to study enrollment; and (5) teachers must have met pre-determined criteria on classroom fidelity and/or quality rating scales. Specifically, all classrooms had to meet an "average" rating (score of 3 out of 5) on four subscales of a validated classroom quality measure – the PDA Program Assessment (Professional Development in Autism Center, 2008) – during an initial classroom visit. In addition, TEACCH and LEAP classrooms had to meet above average ratings (3.5 out of 5) on model-specific subscales and items on their respective fidelity of implementation measures. These ratings were used as screening criteria to ensure that only high-quality classrooms across classroom type were included in the broader efficacy study and provided implementation data related to TEACCH and LEAP practices only.

## 2.3. Data analysis

Three psychometric properties of the CPI were examined: internal consistency, test–retest reliability, and the discriminant validity. First, the internal consistency reliability of the measure was examined via the calculation of Cronbach's alpha coefficients. Second, the test–retest reliability was computed in order to determine if the scores were stable over the school year. Test–retest reliability was assessed via the computation of intra-class correlation coefficients (ICCs)

**Table 1**
School and teacher demographics by treatment model.

| | | TEACCH | | LEAP | | BAU | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| School setting | Urban | 13 | 52.00 | 10 | 45.45 | 18 | 64.29 |
| | Suburban | 12 | 48.00 | 11 | 50.00 | 10 | 35.71 |
| | Rural | 0 | 0.00 | 1 | 4.55 | 0 | 0.00 |
| Minority enrollment | | | 56.90 | | 53.52 | | 54.33 |
| Teacher race | White | 24 | 96.00 | 21 | 95.45 | 27 | 100.00 |
| | Black | 1 | 4.00 | 1 | 4.55 | 0 | 0.00 |
| Teacher gender | Male | 0 | 0.00 | 1 | 4.55 | 0 | 0.00 |
| | Female | 25 | 100.00 | 21 | 95.45 | 27 | 100.00 |
| Teacher highest degree earned | AA | 0 | 0.00 | 1 | 4.55 | 1 | 3.70 |
| | BS/BA | 9 | 36.00 | 6 | 27.27 | 13 | 48.15 |
| | MA/MS | 16 | 64.00 | 14 | 63.64 | 11 | 40.74 |
| | Above MA/MS | 0 | 0.00 | 1 | 4.55 | 2 | 7.41 |

| | | TEACCH | | LEAP | | BAU | |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD |
| Years teaching | | 7.72 | 4.51 | 11.86 | 6.29 | 11.41 | 7.24 |

assessing the proportion of common variance in scores across time points (Shrout & Fleiss, 1979). Finally, the discriminant validity of the measure was examined. This analysis tested the degree to which the CPI could discriminate between the two treatment models and eclectic comparison group. Because the sample in this study was too small to use logistic regression, we used descriptive discriminant analysis (Huberty & Olejnik, 2006) to examine how well the measure predicted group membership.

## 3. Results

### 3.1. Question 1

Does the CPI measure produce reliable scores as judged by the assessment of internal consistency, test–retest reliability, and inter-rater agreement?

#### 3.1.1. Internal consistency
The internal consistency of the CPI was examined using Cronbach's alpha. The overall internal consistency at pre-test was 0.78 and at post-test was 0.84

#### 3.1.2. Test–retest reliability
The CPI was completed by each teacher at the beginning and end of the school year. Test–retest reliability was measured by fitting an unconditional multilevel model (Raudenbush & Bryk, 2002) to scores for all the teachers. Fitting the multilevel model led to estimates of two variance components. A within-classroom variance component represented the variability of each classroom's score about its grand mean, while a between-classrooms variance component represented the variability between classrooms that was stable across raters. The test–retest reliability coefficients were computed by dividing the between-classrooms variance by the total variance, which is the sum of the within- and between-classroom variance components. The resulting ratio is called an intra-class correlation coefficient (ICC) and represents the proportion of variance in the outcome that varies between, rather than within, classrooms. Therefore, the ICC represents the proportion of variance in the scores that is stable across raters. The ICC was computed on the items with no missing data which included CPI Items 1–19. As shown in Table 2, the ICC for the total score was 0.82 (range: 0.28–0.92).

### 3.2. Question 2

Does the CPI produce valid scores as judged by its ability to discriminate between classrooms employing CTMs and eclectic practices?

In a series of univariate ANOVAs for all items (see Table 3), seven items were shown to significantly differentiate the classroom models (Items 4, 5, 6, 8, 13, 16, and 17). Generally, teachers in LEAP classrooms were most likely to endorse using a LEAP classroom model, Relationship Development Intervention (RDI), peer-mediated instruction, and social kills training. Teachers in TEACCH classrooms were most likely to endorse using a TEACCH (structured teaching) model and Picture Exchange Communication System (PECS). Finally, teachers in the eclectic classrooms were most likely to endorse Voice Output Communication (VOCA).

**Table 2**
Test–retest reliability.

| Variable | N | Correlation |
|---|---|---|
| 1. Discrete trial training | 70 | 0.81 |
| 2. Pivotal response training | 70 | 0.60 |
| 3. Floortime or DIR | 70 | 0.37 |
| 4. Relationship development intervention | 70 | 0.76 |
| 5. Structured teaching (TEACCH) | 69 | 0.84 |
| 6. Learning experiences—an alternative program for preschoolers and parents (LEAP) | 69 | 0.92 |
| 7. Incidental or naturalistic teaching | 69 | 0.56 |
| 8. Picture exchange communication system | 70 | 0.72 |
| 9. Verbal behavior | 69 | 0.72 |
| 10. Functional communication training | 69 | 0.37 |
| 11. Visual supports | 70 | 0.83 |
| 12. Video modeling: | 70 | 0.43 |
| 13. Voice output communication | 70 | 0.77 |
| 14. Computer assisted instruction | 70 | 0.43 |
| 15. Social narratives/comic book conversations | 70 | 0.80 |
| 16. Peer-mediated instruction | 70 | 0.78 |
| 17. Social skills training | 70 | 0.39 |
| 18. Self-management | 70 | 0.28 |
| 19. Positive behavior supports | 70 | 0.57 |

**Table 3**
ANOVAs for classroom practices by model type.

| | TEACCH (n = 24) | LEAP (n = 22) | BAU (n = 27) | F value (2, 69) | p |
|---|---|---|---|---|---|
| | Mean (SD) | Mean (SD) | Mean (SD) | | |
| 1. Discrete trial training | 1.33 (1.61) | 1.27 (1.39) | 0.89 (1.31) | 0.71 | 0.495 |
| 2. Pivotal response training | 0.88 (1.33) | 0.91 (1.31) | 1.63 (1.71) | 1.79 | 0.175 |
| 3. Floortime or DIR | 2.42 (1.06) | 2.50 (1.47) | 2.89 (1.37) | 0.90 | 0.412 |
| 4. Relationship development intervention | 0.88 (1.19) | 1.23 (1.63) | 0.30 (0.72) | 3.86 | 0.026[*] |
| 5. Structured teaching (TEACCH) | 4.00 (0.00) | 2.36 (1.33) | 2.58 (1.55) | 13.30 | <0.0001[*] |
| 6. Learning experiences—an alternative program for preschoolers and parents (LEAP) | 0.25 (0.85) | 3.86 (0.47) | 1.19 (1.63) | 63.41 | <0.0001[*] |
| 7. Incidental or naturalistic teaching | 1.88 (1.45) | 2.64 (1.29) | 1.96 (1.68) | 1.77 | 0.178 |
| 8. Picture exchange communication system | 2.71 (1.27) | 1.68 (1.52) | 1.74 (1.48) | 4.07 | 0.021[*] |
| 9. Verbal behavior | 1.08 (1.28) | 0.64 (0.90) | 1.12 (1.61) | 0.95 | 0.391 |
| 10. Functional communication training | 1.08 (1.35) | 0.68 (1.13) | 1.00 (1.39) | 0.61 | 0.549 |
| 11. Visual supports | 3.71 (0.86) | 3.91 (0.29) | 3.81 (0.62) | 0.60 | 0.550 |
| 12. Video modeling: | 0.42 (1.02) | 0.18 (0.85) | 0.00 (0.00) | 1.92 | 0.155 |
| 13. Voice output communication | 1.58 (1.44) | 1.45 (1.60) | 0.52 (0.75) | 5.22 | 0.008[*] |
| 14. Computer assisted instruction | 0.50 (1.06) | 0.59 (1.26) | 0.67 (1.36) | 0.03 | 0.966 |
| 15. Social narratives/comic book conversations | 2.00 (1.25) | 2.09 (1.31) | 1.59 (1.25) | 1.14 | 0.325 |
| 16. Peer-mediated instruction | 1.17 (1.27) | 3.18 (1.33) | 1.00 (1.59) | 16.42 | <0.0001[*] |
| 17. Social skills training | 2.88 (1.23) | 3.73 (0.70) | 3.37 (1.04) | 4.19 | 0.019[*] |
| 18. Self-management | 0.75 (1.11) | 0.77 (1.23) | 1.15 (1.59) | 0.71 | 0.497 |
| 19. Positive behavior supports | 3.21 (1.10) | 3.36 (0.95) | 3.48 (1.05) | 0.37 | 0.693 |

[*] Significant at 0.05 level.

A descriptive discriminant analysis (DDA) was performed to determine the degree to which the items could distinguish between the three classroom types. The DDA results indicated that the items on the CPI significantly separated the three classroom types. Because there were three groups, only two canonical variates (one less than the total number of groups), which represent dimensions of separation between classroom types, can be extracted.

The analysis began by extracting two canonical variates. These canonical variates represent the underlying dimensions that most effectively separated the three groups. Next, the locations of the centroids for the LEAP, TEACCH, and eclectic groups on the two canonical variates were computed. Finally, inspection of the pooled within-classroom canonical coefficients, which are somewhat similar to factor loadings from factor analysis, were examined to determine which subscales contributed most strongly to each canonical variate.

As shown in Fig. 1, the first canonical variate, along the x-axis, separates LEAP classrooms from TEACCH classrooms and LEAP classrooms from eclectic classrooms. It does not separate TEACCH and eclectic classrooms. The first canonical variable is unsurprisingly characterized primarily by Item 6 which directly asks teachers whether they use LEAP. Table 4 highlights the items making the largest contribution to each canonical variable.

The second canonical variable separates TEACCH and LEAP from eclectic, but does not separate TEACCH from LEAP. It is characterized by the use of discrete trial training, RDI, VOCA, social narratives/comic book conversations, and peer-mediated instruction.
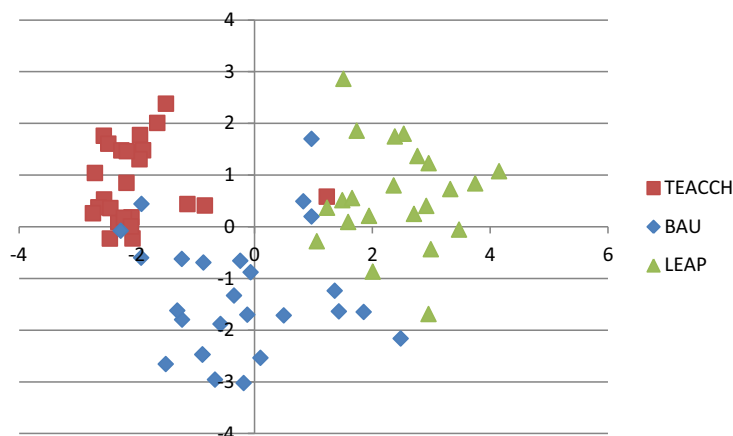
**Fig. 1.** Canonical variates. The first canonical variate (horizontal) separates LEAP classrooms from TEACCH classrooms. The second canonical variate (vertical) separates BAU classrooms from both TEACCH and LEAP classrooms.

**Table 4**
Items with the largest contribution to canonical variates.

| Item | Canonical variate 1 | Canonical variate 2 |
|---|---|---|
| 1. Discrete trial training | 0.18 | 0.68 |
| 2. Pivotal response training | −0.07 | −0.74 |
| 4. Relationship development intervention | 0.18 | 0.72 |
| 5. Structured teaching (TEACCH) | −0.83 | 0.25 |
| 6. Learning experiences—an alternative program for preschoolers and parents (LEAP) | 1.14 | −0.16 |
| 13. Voice output communication | 0.01 | 0.44 |
| 14. Computer assisted instruction | 0.02 | −0.39 |
| 15. Social narratives/comic book conversations: | −0.07 | 0.47 |
| 16. Peer-mediated instruction | −0.23 | 0.54 |

## 4. Discussion

Given the increasing number of school-based intervention studies, there is a need to accurately measure the supplemental classroom practices teachers are using because of their likely impact on child outcomes. The CPI appears to be reliable and valid measure that could be used to accomplish this task. As demonstrated by the high internal consistency and test–retest reliabilities, the CPI can produce reliable assessments of the practices teachers use in classrooms. There was test–retest variability at the item/individual practice level (range = 0.28–0.92), which reflects that teachers were more likely to stop using some practices between the two time points in fall and spring, such as self-management, but remained vigilant in using others, such as the use of LEAP. However, the mean test–retest score was 0.82, which reflects that for the most part, teacher practices remained stable over the course of the school year. The measure can also be used to differentiate among classroom model types. For descriptive data on the practices used by classroom teachers across models see Boyd et al. (2014).

The CPI identified patterns in practices endorsed by teachers following a TEACCH model (i.e., structured teaching, PECS, social narratives/comic book conversations) that are consistent with the emphasis of the TEACCH model on visual supports, schedules, and work/task systems, (Ganz, Kaylor, Bourgeois, & Hadden, 2008; Mesibov & Shea, 1996; Mesibov, Shea, & Schopler, 2005). Patterns in practices endorsed by teachers in LEAP classrooms also were consistent with the aims of the LEAP curriculum (e.g., naturalistic teaching, peer-mediated instruction; Strain & Cordisco, 1994; Strain & Hoyson, 2000). Given these patterns, it appears that the CPI can be used to measure both the self-reported implementation of CTMs and also the supplemental practices that teachers in these models are using.

There is not a clear link indicating why teachers across both TEACCH and LEAP models were more likely to endorse RDI and why teachers in the eclectic classrooms were most likely to endorse VOCA. This may have more to do with the location of certified RDI consultants and/or specialists in augmentative communication who are available to provide services and training to teachers. In addition, specific school districts may have adopted initiatives focusing on the implementation of one practice over another, thus indicating that geography or district location may be an influential factor in predicting practice selection and implementation. These findings emphasize the need for increased understanding of the communities in which interventions are to be implemented, as well as factors that may influence the presence or absence of specific practices (Dingfelder & Mandell, 2011).

Much of the discussion in the field centers around what practices are different across CTMs. However, the descriptive results garnered from this sample used to psychometrically validate the CPI indicate that there was similar use of some instructional strategies across model type (e.g., mean visual support scores were: BAU = 3.82, LEAP = 3.91, and TEACCH = 3.71). As a reliable

and valid tool, the CPI, in partnership with implementation measures, allows researchers and practitioners to better examine the unique features of intervention models and practices, as well as common features—both of which are likely contributing to child growth and outcomes. As the field gains a better understanding of the influence of the overlap between practices across intervention models and eclectic classrooms, tools like the CPI will be key to describe supplemental practices across conditions. In addition, these tools can assist in describing how models are modified (e.g., practices added or removed) as they are more broadly adopted and disseminated across community contexts (Dingfelder & Mandell, 2011).

### 4.1. Limitations

This study had several potential limitations. First, this is a study designed to psychometrically validate the CPI as a tool to provide reliable and valid information about classroom practices across three specific classroom types. Thus, the ability of the measure to capture relevant information in non-TEACCH or LEAP classrooms remains a question. However, we believe the tool could still be useful for classrooms not using those CTMs because it does assess additional practices teachers could be using (e.g., self-management strategies). In addition, the measure does capture a number of focused intervention practices that are likely used in other CTMs. For example, there is an item on discrete trial training, which is often used in comprehensive intensive behavioral treatment approaches. Second, the CPI was designed and administered as a self-report measure, which has the potential for biased responses due to misunderstanding or misinterpretation of items. This problem was addressed in several ways. To minimize the chances that responders may misinterpret the questions, descriptions of each practice were included with each item. Next, to check for potential response bias, scores were corroborated by observations of the classrooms during fidelity visits (see Hume et al., 2011 and Boyd et al., 2014, for detailed descriptions of the fidelity measures, observation procedures and frequency, and descriptive results). Third, this study did not examine quality of the use of practices, but studied only the frequency. From this study, it is not apparent whether these practices were being used as designed: only that teachers reported that they were indeed using them. Thus, the measure has its greatest potential to provide descriptive information about supplemental practices in use, rather than providing data about practice quality. Finally, though we were interested in the construct validity of the measure, our sample was insufficiently sized for factor analysis: Yet, discriminant analysis provided an empirical approach to examine validity of the measure.

### 4.2. Implications

While the CPI was developed for use in TEACCH, LEAP, and eclectic classrooms, it is applicable across other classroom models or curricula, because it includes many of the evidence-based and most commonly used practices implemented in programs serving young children with ASD. As such, the CPI can be used in both research and practical settings to examine the use of strategies and practices. In research, the CPI can be a tool for providing descriptions of the practices used in classrooms. This would facilitate comparisons across different classroom models, and, in particular, classrooms following an eclectic model of practices. Practically, teachers could use the CPI to self-monitor their use of specific strategies with their students, which can assist teachers and districts in several ways. First, the ratings could guide or assist in the evaluation of a school/district/program's professional development programming. The CPI could help programs identify what practices need to be taught and supported in programs, and/or assist in evaluating whether provided professional development has impacted teacher usage of specific practices. In addition, research indicates that when teachers actively monitor, reflect upon, and evaluate their use of specific classroom practices, frequency of practice usage can increase (Kalis, Vannest, & Parker, 2007). Encouraging teachers to select specific practices and monitor their usage over time with the CPI has potential to assist in modifying teacher behaviors (Kalis et al., 2007).

### 4.3. Conclusion

Evidence-based practice is often referred to in the singular (versus plural) form as though practitioners are only implementing one strategy with the children or clients they serve. In reality, many practitioners, in particular school-based practitioners, are using a variety of educational strategies and therapeutic techniques to address the needs of children in their classrooms. The assumption is often that the eclectic nature and likely haphazard use of these practices would have minimal impact on student outcomes. Thus, teachers' use of supplemental practices has not been measured within the context of school-based intervention research. Recent findings suggest this conventional wisdom may not be the case (Boyd et al., 2014). Thus, there is a need for psychometrically valid measures to capture what teachers are doing, and the extent to which this augments or negates the effects of any intervention. The CPI can be used to discriminate among classroom models, and can be used to provide descriptive information about classrooms following a prescribed comprehensive treatment model as well as those providing an eclectic model of services.

**Appendix. CLASSROOM PRACTICE INVENTORY**

**Directions**: *Please select the response that most accurately reflects how often you use the practice, strategy, or curricula during an average school day.*

**0** I don't ever use this practice with any of my students
**1** I occasionally use this practice with some of my students (fewer than half)
**2** I occasionally use this practice with most of my students (more than half)
**3** I use this practice frequently with some of my students (fewer than half)
**4** I use this practice frequently with most of my students (more than half)

| Classroom Practice | Use of Practice | | | | |
|---|---|---|---|---|---|

**Behavioral Approaches**

1. Discrete Trial Training:   **0**   **1**   **2**   **3**   **4**
DTT is an intensive behavioral treatment designed to assist children with autism. DTT is conducted using massed teaching drills of selected materials. A specific behavior is prompted or guided, and children receive reinforcement for proper responses.

2. Pivotal Response Training:   **0**   **1**   **2**   **3**   **4**
PRT is a naturalistic behavioral intervention based on principles of applied behavior analysis. Researchers have identified pivotal behaviors that affect a wide range of behaviors in children with autism. PRT strategies are used to target these pivotal behaviors (e.g., social motivation).

**Developmental Approaches**

3. Floortime or DIR:   **0**   **1**   **2**   **3**   **4**
Floortime is a developmental intervention developed by Stanley Greenspan. Floortime involves practitioners entering the child's activities and following the child's lead. The practitioners join the child in his or her preferred activity rather than demanding that the child join them in their preferred activity. While the practitioner joins in with the child, the intent is to develop the activity into an affective interaction.

4. Relationship Development Intervention:   **0**   **1**   **2**   **3**   **4**
RDI is an approach developed by Drs. Steve Gutstein and Rachelle Sheely. RDI is based on the stages of development of neuro-typical children and has as its cornerstone the belief that due to an innate or received information processing disorder, autistic children miss out on some of these stages. RDI is about revisiting the missed stages. It involves 6 areas—Emotional Referencing, Social Coordination, Declarative Language, Flexible Thinking, Relational Information Processing, and Foresight and Hindsight.

**Additional Approaches**

5. Structured Teaching (TEACCH):   **0**   **1**   **2**   **3**   **4**
TEACCH is an intervention approach that emphasizes the "culture of autism." As part of this philosophical approach, intervention strategies have been developed to help modify the environment to meet the needs of children with autism, in particular, the use of physical arrangement of the classroom, daily schedules for children, and individual work systems.

6. Learning Experiences—An Alternative program for Preschoolers and Parents (LEAP):   **0**   **1**   **2**   **3**   **4**
LEAP is a comprehensive preschool service designed for both children with autism and typically developing children. LEAP has the components of an integrated preschool program and a behavior skills training program for parents. The primary goals of the curriculum are to expose children with autism to typical preschool activities and to adapt the typical curriculum for the children with autism only when necessary.

| | **0** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|

**7. Incidental or Naturalistic Teaching:**     **0    1    2    3    4**
Incidental teaching uses strategies from the field of applied behavior analysis (ABA) to present learning objectives within typical early childhood activities, instead of sitting face to face with the child at a table in a clinical setting. Teachers arrange the environment by placing preferred toys and activities of each student within sight, but not within reach, to encourage the student to initiate teaching sessions based on preplanned learning objectives.

**Communication Strategies**

**8. Picture Exchange Communication System:**     **0    1    2    3    4**
PECS is an augmentative/alternative communication system. This technique was developed for use with young nonverbal children or children with limited functional speech. To learn PECS, children progress through sequenced phases. In general, children using PECS are taught to approach and give a picture of a desired item to a communicative partner in exchange for that item.

**9. Verbal Behavior:**     **0    1    2    3    4**
VB is based on applied behavior analysis. This approach focuses on the development of verbal operants (e.g., mands, tacts) rather than on words and their meanings, and on the independent training of speaker and listener repertoires.

**10. Functional Communication Training:**     **0    1    2    3    4**
FCT uses communication to reduce interfering behaviors. More specifically, students are taught an alternative communicative form, which replaces a less desirable behavior, to meet the same function (i.e., outcome). To use FCT, a functional behavioral assessment (FBA) should be completed, and appropriate communicative alternatives should be identified, taught, and reinforced.

**Environmental Supports**

**11. Visual Supports:**     **0    1    2    3    4**
Visual supports or visually cued instruction refers to the use of cues such as objects, photographs, icons, written scripts/lists or videos, in order to prepare, prompt, or promote expectations across curricular areas (e.g., social skills, adaptive behavior, academic skills).

**Technology Supports**

**12. Video Modeling:**     **0    1    2    3    4**
Video modeling provides a videotaped model of a specific behavior (e.g., play skills, social skills) in an effort to change existing behaviors or learn new ones. A student watches the model's behavior and after systematic viewing and practice, he/she demonstrates that specific behavior in natural settings.

**13. Voice Output Communication Aids (VOCA):**     **0    1    2    3    4**
VOCAs are portable electronic devices providing speech output with either synthetic (computer generated) or digitized (recorded) voices. The devices use a variety of graphic symbols or pictures to represent personalized messages for the individual, who uses his or her hand, finger, or some other means (e.g., switch or eye gaze) to activate the device.

**14. Computer Assisted Instruction:**     **0    1    2    3    4**
Instruction presented via computer that contains behavioral objectives (learning goals), results in immediate feedback and high rates of active-student responding, and requires that the individual achieve a criterion for mastery before advancing to more complex instruction.

**Social Supports**

**15. Social Narratives/Comic Book Conversations:**     **0    1    2    3    4**
Social Narratives are a tool for teaching social skills to children with autism and related disabilities. Social Narratives provide the child with written, accurate information about those situations that he/she may find difficult or confusing.

| | **0** | **1** | **2** | **3** | **4** |
|---|---|---|---|---|---|

16. Peer-mediated Instruction:     **0**    **1**    **2**    **3**    **4**
Peer mediated interventions are based on principles of behaviorism and social learning theory. Typical peers are carefully and systematically taught ways of engaging children with disabilities, including autism, in positive and extended social interactions.

17. Social Skills Training:     **0**    **1**    **2**    **3**    **4**
Explicit instruction for students with autism on how to initiate or sustain social interaction with peers, and/or how to better understand social situations. This may include small group instruction, role-playing, and group activities such as games or crafts.

**Behavior Supports**

18. Self-management:     **0**    **1**    **2**    **3**    **4**
Self management is the ability to manage ones' behavior without additional adult intervention or assistance. This includes teaching students to self- monitor (i.e., keep track of specific behavior such as the number of social initiations), self-evaluate (i.e., determine if the behavior that was monitored meets a predetermined criteria for quality or quantity), and self-reinforce (i.e., reward themselves if the self evaluation warrants).

19. Positive Behavior Supports:     **0**    **1**    **2**    **3**    **4**
Positive behavior support aims to decrease potentially problematic behavior by enhancing an individual's lifestyle, making environmental changes, and teaching new skills rather than focusing directly on reducing the problem behavior.

**Other Approaches or Supports**

20. Other: (please specify) _____     **0**    **1**    **2**    **3**    **4**
_____
_____

21. Other: (please specify) _____     **0**    **1**    **2**    **3**    **4**
_____
_____

**Curriculum**

22. High/Scope:     **0**    **1**    **2**    **3**    **4**
The curriculum is built around teacher- and child-initiated learning activities in five main curriculum content areas: approaches to learning; language, literacy, & communication; social and emotional development; physical development, health, and well being; and arts and sciences.

23. Creative Curriculum:     **0**    **1**    **2**    **3**    **4**
The Creative Curriculum balances both teacher-directed and child-initiated learning, with an emphasis on responding to children's learning styles and building on their strengths and interests.

24. Other Curriculum: (please specify)     **0**    **1**    **2**    **3**    **4**
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## References

Boyd, B., Hume, K., McBee, M., Alessandri, M., Guterriez, A., Johnson, L., et al. (2014). Comparative efficacy of LEAP, TEACCH and non-model-specific special education programs for preschoolers with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 44*, 366–380.

Classroom Practice Inventory. (2007). *Project Staff of "TEACCH/LEAP project, comparison of two comprehensive treatment models for preschool-aged children with autism and their families".*

Dillenburger, K. (2011). The emperor's new clothes: Eclecticism in autism treatment. *Research in Autism Spectrum Disorders, 5*, 1119–1128.

Dingfelder, H., & Mandell, D. (2011). Bridging the research-to-practice gap in autism intervention: An application of diffusion of innovation theory. *Journal of Autism and Developmental Disorders, 41*, 597–609.

Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327–350.

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2002). Intensive behavioral treatment at school for 4–7 year-old children with autism: A 1-year comparison controlled study. *Behavior Modification, 26*, 49–78.

Fava, L., Strauss, K., Valeri, G., D'Elia, L., Arima, S., & Vicari, S. (2011). The effectiveness of a cross-setting complementary staff-and-parent mediated early intensive behavioral intervention for young children with ASD. *Research in Autism Spectrum Disorders, 5*, 1479–1492.

Ganz, J. B., Kaylor, M., Bourgeois, B., & Hadden, K. (2008). The impact of social scripts and visual cues on verbal communication in three children with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 23*, 79–94.

Gutstein, S. E., & Sheely, R. K. (2002). *Relationship development intervention with older children, adolescents and adults: Social and emotional development activities for Asperger syndrome, autism, PDD and NLD*. London: Jessica Kingsley Publishers.

Hess, K. L., Morrier, M. J., Heflin, L. J., & Ivey, M. L. (2008). Autism treatment survey: Services received by children with autism spectrum disorders in public school classrooms. *Journal of Autism and Developmental Disorders, 38*, 961–971.

Howard, J. S., Sparkman, C. R., Cohen, H. G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities, 26*, 359–383.

Huberty, C. J., & Olejnik, S. (2006). *Applied MANOVA and discriminant analysis* (2nd ed.). Hoboken, NJ: Wiley.

Hume, K., Bellini, S., & Pratt, C. (2005). The usage patterns and perceived outcomes of early intervention and early childhood programs for young children with autism spectrum disorders. *Topics in Early Childhood Special Education, 25*, 194–207.

Hume, K., Boyd, B., McBee, M., Coman, D., Guterriez, A., Shaw, E., et al. (2011). Assessing implementation of comprehensive treatment models for young children with ASD: Reliability and validity of two measures. *Research in Autism Spectrum Disorders, 5*, 1430–1440.

Iovannone, R., Dunlap, G., Huber, J., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 18*, 150–165.

Kalis, T. M., Vannest, K. J., & Parker, R. (2007). Praise counts: Using self-monitoring to increase effective teaching practices. *Preventing School Failure, 51*, 20–27.

Mesibov, G. B., & Shea, V. (1996). Full inclusion and students with autism. *Journal of Autism and Developmental Disorders, 26*, 337–346.

Mesibov, G. B., Shea, V., & Schopler, E. (2005). *Structured Teaching'' from the TEACCH approach to autism spectrum disorders*. New York: Kluwer Academic/Plenum.

Moncher, F. J., & Prinz, F. J. (1991). Treatment fidelity in outcome studies. *Clinical Psychology Review, 11*, 247–266.

Mowbrey, C. T., Holter, M. C., Teague, G. B., & Bybee, D. (2003). Fidelity criteria: Development, measurement, and validation. *American Journal of Evaluation, 24*, 315–340.

Odom, S. L., Boyd, B. A., Hall, L. J., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 40*, 425–436.

Odom, S., Boyd, B., Hall, L., & Hume, K. (2014). Comprehensive treatment models for children and youth with autism spectrum disorders. In F. Volkmar, S. Rogers, K. Pelphrey, & R. Paul (Eds.), *Handbook of autism and pervasive developmental disorders*(4th ed.).

Odom, S., Hume, K., Boyd, B., & Stabel, A. (2012). Moving beyond the intensive behavior treatment versus eclectic dichotomy: Evidence-based and individualized programs for learners with ASD. *Behavior Modification, 36*, 270–297.

Professional Development in Autism Center. (2008). *PDA program assessment*. Seattle, WA: PDA Center at University of Washington.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks, CA: Sage.

Reichow, B., Barton, E. E., Boyd, B. A., & Hume, K. (2012). Early intensive behavioral intervention (EIBI) for young children with autism spectrum disorders (ASD). *Cochrane Database of Systematic Reviews10* http://dx.doi.org/10.1002/14651858

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*, 420–428.

Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., Odom, S., et al. (2007). Designing research studies in psychosocial interventions in autism. *Journal of Autism and Developmental Disorders, 37*, 354–366.

Stahmer, A., Collings, N., & Palinkas, L. (2005). Early intervention practices for children with autism: Descriptions from community providers. *Focus on Autism and Other Developmental Disabilities, 20*, 66–79.

Stahmer, A., Leslie, L. K., Hurlburt, M., Barth, R. P., Webb, M. B., Landsverk, J., et al. (2005). Developmental and behavioral needs and service use for young children in child welfare. *Pediatrics, 116*, 891–900.

Stahmer, A., Schreibman, L., & Cunningham, A. (2010). Toward a technology of treatment individualization for young children with autism spectrum disorders. *Brain Research, 22*, 229–239.

Strain, P., & Cordisco, K. (1994). The LEAP preschool. In S. Harris & J. Handleman (Eds.), *Preschool education programs for children with autism* (pp. 115–126). Austin, TX: Pro-Ed.

Strain, P., & Hoyson, M. (2000). The need for longitudinal, intensive social skill intervention: LEAP follow-up outcomes for children with autism. *Topics in Early Childhood Special Education, 20*, 116–122.