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The Impact of Teachers' Beliefs About Evidence-Based Practices on the Outcome of Students with ASD: Does Teacher Believing Relate to Student Achieving?

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OUTCOME OF STUDENTS WITH ASD: DOES TEACHER BELIEVING RELATE TO STUDENT
ACHIEVING?

By

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In 2006, the American Psychological Association (APA) appointed a Task Force that outlined the field of psychology's commitment to the use of evidence-based practices (EBPs) and emphasized the importance of using EBPs in all areas of treatment and education (APA Presidential Task Force, 2006). Although the importance of utilizing these practices was identified, a wide research-to-practice gap remains, particularly in educational settings. A crucial component of advancing the use of EBPs in these settings is to understand teachers' attitudes towards implementing EBPs in their classrooms. Prior research has identified some possible factors contributing to teacher variability in motivation to implement EBPs (e.g. Boardman, Argüelles, Vaughn, Hughes, & Klingner, 2005.; Stahmer & Aarons, 2009), but little work has examined teacher attitudes toward these practices. The unanswered question is, for teachers who are implementing EBPs, what is the impact of their attitudes towards adopting these practices in their classrooms on the students they teach? This project sought to better understand the impact of teacher attitudes towards the adoption and implementation of EBPs on the outcomes of preschool students with autism. Specifically, the current study assessed the relationship between teacher attitudes toward EBPs and student outcome in the areas of autism severity (AS), language development (LD), and overall cognitive functioning (CF). Results indicated that on average students in this sample made progress across the year in all three domains. However, there was no relationship between teacher attitudes and student outcomes in this particular sample.

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Chapter 1: Introduction

Overview of Autism Spectrum Disorders

Autism is a pervasive developmental disorder characterized by social dysfunction, communicative difficulties, as well as restricted, repetitive or ritualistic behaviors, interests, and activities (American Psychiatric Association, 2000). Though the etiology of autism remains unknown, the prevalence of this neurodevelopmental disorder has increased from 1 in 2,000 children in the 1980s (Newschaffer et al., 2007) to more than 1 in 88 children currently (Centers for Disease Control, 2012). Given this reported rise in prevalence, researchers are motivated to uncover the etiology of autism and are also focusing increasingly more on the impact this disorder has on society, families, and the diagnosed child (Newschaffer et al., 2007).

Three diagnoses fall under the umbrella category of Autism Spectrum Disorder (ASD), though currently understanding differences between these diagnoses is based solely on behavioral symptom presentation rather than specific biological or genetic markers (Lord, 2010). Although the specificity of the differences among these three remains highly debated, important differences in symptom presentation appear to exist among those with Autistic Disorder (AD), Asperger Syndrome (AS) and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). Autistic Disorder encompasses deficits in all core domains. Behavioral characteristics of Asperger Syndrome differ from Autistic Disorder in that individuals with AS generally have average cognitive functioning and little to no delays in language acquisition. PDD-NOS is qualitatively different from Autistic Disorder in that children meet criteria for impairment in social functioning, but do not show significant enough impairment in communication or repetitive behavior domains to warrant a diagnosis of Autistic Disorder (Newschaffer et al., 2007). Though these distinct diagnostic categories exist, ASD is most appropriately considered a spectrum disorder, and this will

likely be reflected in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V).

With the increasing prevalence of children diagnosed with ASD comes the need for effective treatment models, therapy approaches, and community-based services for these individuals. Intervention approaches with sound empirical support should be the "gold standard" for educating children with ASD; however, more often than not, empirically supported interventions are not used in clinical practice (Storch & Crisp, 2004; Weersing, Weisz, & Donenberg, 2002). Many researchers investigating the efficacy of treatment models strive to not only find empirically validated treatments for a disorder, but to then disseminate that information into community settings where such programs can be implemented, ultimately bringing a higher quality of care to families and children seeking services. Evidence based treatment models will give practitioners the tools needed to deliver standardized and effective treatments to clients, including those with autism. The American Psychological Association (APA) policy statement on evidence-based treatments in psychology defines evidence-based practices (EBPs) as "the integration of the best available research with clinical expertise in the context of patient characteristics, culture and preferences" (APA, 2006, p. 3). Though mental health researchers were the first to formalize research into EBPs, such studies have now extended into the field of psychology, and more specifically, into evidence-based schooling practices for children with autism spectrum disorders.

Historical Significance of Evidence-Based Practices

Historically, the interest of psychologists in evidence-based approaches to patient care can be dated as far back as Lightner Witmer, who opened the first psychological clinic in 1896. In his 1907 article, Witmer quoted the president of the American Association for the Advancement of Science who said, "The final test of the value of what is called science is

its applicability" (p. 249), highlighting the significance of applying research to practice. He went on to discuss how pure and applied sciences advance together, and how the purpose of a clinical psychologist is "to discover the relation between cause and effect in applying the various pedagogical remedies to a child who is suffering from general or special retardation" (p. 251). Witmer was the first of many psychologists to introduce an evidence-based approach to patient care; an approach that continues to direct researchers, including those in the field of ASD, today.

During the 1990s, increased investigation of evidence-based practices was spearheaded by mental health researchers, with the intended goal of disseminating EBPs to community practitioners, providing sound evidence for reliable treatment that was not based solely on clinical judgment. Healthcare providers, who were already learning to review relevant research literature, could then synthesize empirical and contextual evidence and translate pertinent research findings for use in their own community settings (Rosswurm & Larrabee, 1999). Medical researchers highlighted the need for judicious use of "best evidence" to guide treatment of individual patients (Sackett, Rosenberg, Muir-Gray, Haynes, & Richardson, 1996). In a similar manner, researchers in the field of psychology continue to advance their own investigation of evidence-based treatments, in hopes of providing standardized guidelines for best practices to clinicians in the community (APA, 2006).

Evidence-Based Practices in ASD Intervention

Evidence-based treatments for children with Autism Spectrum Disorders (ASD) have recently received heightened attention among researchers. Seminal treatment outcome studies show that children who receive intensive and highly structured intervention at an early age make substantial gains in areas such as language and social development (Lovaas, 1987; Sallows & Graupner, 2005). In an effort to better understand

the collective research supporting the use of EBPs in the treatment of behavioral difficulties in ASD, Rogers and Vismara (2008) completed a comprehensive review of the state of evidence-based practices utilized with young children diagnosed with autism. Using a previously established graded criteria system created by Chambless and Hollon (1998), Rogers and Vismara focused their review on behaviorally based psychosocial interventions. Categories were defined, including "well established," "probably efficacious," and "possibly efficacious," depending on evidence of an established treatment manual, size of participant groups engaged in research studies, and numbers of either independent group studies or single subject design studies. Based on this review, only Lovaas' treatment methods met qualifications for a "well-established" method, as it was the only evidence-based treatment package that was shown to be efficacious in multiple research studies.

The authors note the field is still very early in the process of determining what types of programs are best for children with autism, and highlight how further research is critical to our understanding of how to best intervene effectively to support and educate children with ASD. Many other programs reviewed in the study were considered "probably efficacious," and the hope is that with additional research studies, these programs will be deemed "well-established" in the future. This is important because if additional intervention strategies are shown to be effective, teachers and community practitioners will have multiple methods from which to choose and will also have an opportunity to combine intervention approaches for individual children based on their unique profile of needs.

Dissemination of EBPs into Community Settings

The importance of utilizing EBPs is not only emphasized by researchers investigating these practices, but also by clinical practitioners seeing patients in the community. One of the greatest benefits of using EBPs is that they give the lay community a concrete understanding of what programs and treatment approaches are supported by

research. Though in many cases EBPs have empirical support from the scientific community, support from clinicians and consumers is also necessary to ensure complete and meaningful translation of the treatment methods from research into practice (Aarons, 2005). While the lay community may not be as familiar with current research findings, the provider is responsible for using empirically sound methods to treat their patients (Boyd, Odom, Humphreys, & Sam, 2010), and thus dissemination of research findings that establish certain EBPs as efficacious is critical to the betterment of treatment and education received by individuals with ASD.

Evidence-based practices can also be adapted for use by parents for utilization with children at home (Stahmer & Aarons, 2009). Often parents who are dealing with problematic behaviors in their home are unsure of how to best address the difficulties that they face when the child is not in school. Training programs that have strategies for parents that focus on evidence-based methods give parents the tools necessary to standardize their own approaches and to mimic the modifications used by community practitioners or teachers in the school environment. This type of multi-instructional approach allows practitioners, educators, and parents to work together to promote optimal outcomes for a child.

An additional important consideration, and one that needs further investigation, is the possibility that using EBPs may also be a good way to reduce cost for practitioner or parent, as it provides a structured treatment model that specifies goals for progress (Aarons, 2005). This could be a significant benefit to all clinical settings, schools and families who are in need of such programs but who may not have ample financial resources needed to seek out private therapies.

Though the use of EBPs in community settings has increased, a considerable amount of debate surrounds these practices. Many researchers also find evidence-based practices

do not take into consideration unique characteristics of minority groups and cultural
diversity (Sue et al., 2006). Often, effective treatment outcomes in controlled settings do not
translate reliably into clinical settings (Franklin, DeRubeis & Westen, 2006), and
standardization of treatment models may not improve patient outcomes (Addis, Cardemil,
Duncan & Miller, 2006). Though considerable research has demonstrated the importance of
empirically sound treatment models, much research is still needed to improve
dissemination into practice and to increase sensitivity of these programs to cultural
differences. Further research that compares groups of individuals from various cultural
backgrounds, as well as research that is conducted in the community settings where
interventions are being used will shed light on cultural differences that need to be
addressed in future EBPs, as well as promote a better understanding of challenges faced in
clinical or community-based settings.

Frequently, attitudes of many community practitioners are generally based on more
of a "wait and see" perspective (Boyd et al., 2010), where a practitioner would prefer to wait
to see how widely-accepted a particular treatment modification becomes prior to his or her
own implementation. Unfortunately, this perspective widens the gap between research and
practice, a gap that many researchers are currently trying to close (Weisz, Chu & Polo, 2004;
Dingfelder & Mandell, 2010). It is imperative that researchers enter into the clinical or
community-based settings where these EBPs are expected to be implemented, so as to
better understand the opinions and views of educators or community-based practitioners
and to continue to close this research-to-practice gap.

Dissemination of EBPs into Schools

Research has guided the understanding of evidence based practices (EBPs) and
subsequent implementation of these programs in school and community-based settings. As
the definition implies, EBPs provide justification for specific treatment models based on

validated research. Once an established practice, an evidence-based treatment model can provide teachers with structure and guidance about how to implement programs that could be successfully utilized in their classrooms. The use of these validated treatment models is especially important due to the increased use of screening measures used to identify individuals at a younger age who show symptoms of ASD. Early identification enables these children to receive educational services provided by these treatment models early in their development, hopefully promoting a better outcome behaviorally, academically and socially (Boyd, 2010).

A current concern highlighted by researchers investigating the dissemination of EBPs specifically into school-based settings is that often there is pressure from school administrators or supervisors to use EBPs, regardless of whether a teacher is ready, willing, or even interested in a particular method of instruction (Aarons, 2005). This pressure can yield undue stress for the teacher, but if equipped with the proper training in this established method of treatment, the strategies learned may have a significantly positive effect upon the child receiving the services. This issue emphasizes the importance of training and support for teachers implementing treatment models, but also raises the issue of teacher readiness and acceptance of EBPs as a possible factor impacting not only the proper implementation of EBPs, but also student outcomes across the school year.

Specific benefits are evident in school settings when EBPs are effectively implemented. Often paraprofessionals who work directly with children with ASD may not be required to have advanced training in educating a child with a disability, so providing specific EBPs allows for specialized training and a more tailored program of education for the child (Stahmer & Aarons, 2009). Additionally, a variety of efficacious comprehensive treatment packages are available at this time, allowing teachers to select a treatment program that most closely aligns with their pedagogical orientation (Rogers & Vismara,

2008). Again, though many programs are available, future research examining the efficacy of these varying treatment models comprised of evidence-based practices will shed light on the "gold-standards" or most efficacious ways of teaching children with autism.

During the 1980s to 1990s, policies were put in place to urge teachers and school districts to use a more data-based approach to assessing students' performance, and to further use the data gathered to guide instruction (Honig & Coburn, 2008). With the passing of the No Child Left Behind Act (NCLB), schools faced demands that required programs implemented in schools to be driven by "scientifically based research" and to be "data-driven (NCLB Act, 2002)." While this act was intended to require teachers and school districts to implement EBPs in their schools, little is known about how teachers and administrators felt about adopting such practices. Now that EBPs are being utilized in classrooms due to the requirements of the NCLB Act, how do the beliefs about these practices translate to the students who are being taught in these classrooms? Does a teacher's attitude toward adopting EBPs have any impact on the students they teach?

Study Aims

The goal of this research is to gain a better understanding of how teachers impact students with ASD. We are particularly interested in those teachers implementing their particular evidence-based classroom models at a high level of fidelity (see participant section). Specifically, we are interested in how a teacher's attitude toward the use of EBPs affects students with ASD in his or her classroom in three domains: a child's ASD symptom severity, level of language acquisition, and overall level of cognitive functioning. Our research questions and hypotheses are as follows:

Research Question 1: Are preschool teacher attitudes toward evidence-based practices at the start of a school year related to autism symptom severity in their students at the end of a school year?

Hypothesis 1: It is anticipated that positive overall attitudes toward EBPs at the beginning of the school year will be negatively correlated with a child's symptom severity at the end of the year.

Research Question 2: Are preschool teacher attitudes toward evidence-based practices at the start of a school year related to differences in language acquisition outcomes in their students at the end of the school year?

Hypothesis 2: It is expected that teacher attitudes toward EBPs will be positively correlated with changes in language development in students with ASD.

Research Question 3: Do preschool teacher attitudes toward EBPs in the beginning of the school year relate to differences in overall levels of cognitive functioning in students with ASD at the end of the school year?

Hypothesis 3: It is expected that a teachers' attitudes toward the use of EBPs will be positively correlated with children with ASD's overall levels of cognitive functioning.

Chapter 2: Methods

Overview

This study stems from a larger, multi-site project entitled *Comparison of Two Comprehensive Treatment Models for Preschool-Aged Children with Autism and Their Families.* The four institutions participating in this project include The University of North Carolina at Chapel Hill, the University of Miami, the University of Colorado at Denver and the University of Minnesota. Funding for this project was provided by the Institute for Education Sciences (IES).

The main goal of this multi-site project is to contribute to the improvement of the cognitive, communication, academic, social and behavioral outcomes of preschool-aged children identified with autism spectrum disorder (ASD) and their families. The specific objective is to establish the relative efficacy of two existing comprehensive preschool treatment models, the Treatment and Education of Autistic and Communication-handicapped Children (TEACCH) model and the Learning Experiences: Alternative Program for Preschoolers and Parents (LEAP) model, as compared to Business As Usual (BAU) classrooms.

While the current research study does not aim to understand differences across these three classroom types, it is helpful to understand the unique treatment aspects of these models. TEACCH is a structured-teaching model that was originally established in 1972 by Eric Schopler (Odom & Boyd, 2006). This program emphasizes a highly structured classroom environment, where student learning is accomplished through the emphasis of visual learning and self-initiated communication (Mesibov & Shea, 2010). Contrastingly, LEAP is a naturalistic teaching model originally established in 1981 by Phillip Strain (Strain & Cordisco, 1994). LEAP emphasizes learning programs that are data-driven, but that occur in a context where children with ASD are immersed in a classroom with typically

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developing children, and learning occurs through the incorporation of lessons within general school-based activities and routines (Strain, Kohler, & Goldstein, 1996). BAU classrooms are not guided by a structured conceptual framework, but are rather considered a more eclectic approach to utilizing numerous EBPs in the classroom setting. Though some research has been done to better understand what intervention techniques are being used in these more eclectic settings (Stahmer, Collings, & Palinkas, 2005), it seems that these settings use a variety of evidence-based strategies, but they simply do not follow a more comprehensive or packaged autism-specific treatment model (like TEACCH or LEAP).

Classroom and Teacher Inclusion Criteria

Inclusion criteria for teachers participating in this study were outlined for each group (TEACCH, LEAP and BAU). First, each teacher needed to implement their respective treatment model for a minimum of two years prior to participating in the study. Additionally, participating teachers were required to hold special education certification in their respective state, be teaching within a public school system, and be implementing their specific treatment model at a high level of fidelity (*see* Hume et al., 2011). Specific fidelity of implementation measures were created and validated for each group (TEACCH, LEAP and BAU). A TEACCH-specific measure was used to evaluate the TEACCH teachers' fidelity of implementation of the TEACCH model. Similarly, a LEAP-specific measure was used to evaluate the LEAP teachers' fidelity of implementation of the LEAP model. Lastly, the BAU classrooms were assessed using the Professional Development in Autism measure (PDA; Hume et al., 2011) that systematically assessed the fidelity of implementation of an eclectic mix of EBPs generally used in autism classrooms. Sound psychometric data have been published on these three measures (see Hume et al., 2011).

TEACCH classroom inclusion criteria. In addition to the criteria noted above, teachers who were included in the TEACCH treatment group were required to have attended formal TEACCH training by model developers or an appropriately trained district staff member prior to participating in the study. Teachers were also required to attend a supplemental booster training provided by a certified TEACCH trainer at each site, which occurred at the end of the summer prior to the year each teacher participated in the study. To ensure an above-average level of fidelity of implementation of the TEACCH model, specific criteria were used to identify optimal candidates for participation. On the TEACCH fidelity measure, participants were required to meet an average score of 3.5 out of 5 across three subsections, including Physical Structure, Visual Schedules, and Work Systems. On the Professional Development in Autism (PDA) measure, the classroom needed to be evaluated at a minimum 3 out of 5 score overall, or an average of 3 on at least 4 sections of the measure. This measure's subsections included Classroom Structure, Classroom Environment, Curriculum and Instruction, and Positive Instructional Climate (Hume, et al., 2011).

LEAP classroom inclusion criteria. Teachers who were included in the LEAP treatment group were required to attend formal LEAP training by model developers or an appropriately trained district staff member prior to participating in the study. Teachers were also required to attend a supplemental booster training provided by a certified LEAP trainer at each site. Booster sessions occurred at the end of the summer prior to the year each teacher participated in the study. To ensure an above-average level of fidelity of implementation of the LEAP model, specific criteria were used to identify optimal candidates for participation. On the LEAP fidelity measure, participants were required to meet an average score of 3.5 out of 5 across two subsections, including Teaching Strategies and Promoting Social Interactions. On the Professional Development in Autism (PDA)

measure, the classroom needed to be evaluated at a minimum 3 out of 5 score overall, or an average of 3 on at least 4 sections of the measure. This measure's subsections included Classroom Structure, Classroom Environment, Curriculum and Instruction, and Positive Instructional Climate (Hume, et al., 2011).

BAU classroom inclusion criteria. Teachers who were included in the BAU group were required to have taught in a preschool classroom for children with autism for at least two years. Additionally, on the Professional Development in Autism (PDA) measure, the classroom needed to be evaluated at a minimum 4 out of 5 score overall, or an average of 4 on at least 4 sections of the measure. This measure's subsections included Classroom Structure, Classroom Environment, Curriculum and Instruction, and Positive Instructional Climate. It is important to note the BAU classrooms were evaluated using more stringent inclusion criteria because they were not required to have any formal training in an autism-specific treatment model and were not afforded the benefit of attending any booster trainings prior to participating in the study.

Participant Demographics

A total of 49 teachers (16 TEACCH, 15 LEAP, 18 BAU) participated in the current study. Fourteen teachers were from North Carolina, 16 teachers were from Florida, 12 teachers were from Colorado, and 7 teachers were from Minnesota. A total of 48 female teachers and one male participated. With regard to ethnicity, 40 teachers identified themselves as non-Hispanic and 9 Hispanic. All 49 teachers identified their race as Caucasian. See Table 1 for a summary of teacher demographic data. Teachers in this study had between 2 and 30 years of teaching experience, and anywhere from 2 to twenty-two years of teaching in a classroom for children with ASD. Table 2 provides information about how many years teachers in our sample have been teaching, and Table 3 illustrates how many years teachers in the sample have taught in classrooms for children with ASD.

A total of 144 children (55 TEACCH, 45 LEAP, 44 BAU) participated in the current study. The distribution of children by state included 42 children from North Carolina, 55 from Florida, 15 from Colorado, and 32 from Minnesota. A total of 21 female and 123 male children participated. The distribution of race across the group included 110 children who were identified as White, 8 who identified as Asian, 14 who identified as Black, and 7 who identified as Multiracial.   See table 4 for a summary of child demographic data.

Procedures

Teacher procedures. All teachers who were eligible to participate in the study were screened, enrolled and consented prior to active participation. Fidelity of implementation of their respective treatment models occurred to screen classrooms into the study for participation, and then at four time points during the school year (e.g. T1 occurred during early fall, T2 occurred during late fall, T3 occurred during early spring, and T4 occurred during late spring.) Two of these time points also consisted of reliability checks. Teachers were asked to complete the Teacher Version of the Evidence-Based Practices Attitudes Scale (EBPAS; Aarons, 2004) at Pre and Post time points. Only teachers' pre-test scores were used in the current study. See Table 5 for a summary of the present study's assessment schedule for teachers.

Child procedures. All families who had children eligible to participate in the study were screened, enrolled and consented prior to active participation. The Autism Diagnostic Observation Schedules (ADOS; Lord et al., 2000), Mullen Scales of Early Learning (MSEL; Mullen, 1995), and the Preschool Language Assessment (PLS-4; Zimmerman, Steiner, & Pond, 2002) were administered to the children at the beginning of the school year (Pre time point) and at the end of the school year (Post time point). See Table 6 for a summary of the child assessment schedule.

Chapter 3: Measures

Evidence-Based Practice Attitudes Scale (EBPAS)

The Teacher Version of the Evidence-Based Practice Attitudes Scale is a 15-item questionnaire that assesses teacher attitudes toward the adoption of EBPs (EBPAS; Aarons, 2004; Aarons, McDonald, Sheehan, & Walrath-Greene, 2007; Aarons, et al., 2010). Providers rate the extent to which they agree with each item (e.g., "I like to use new types of methods/interventions to help my students," or "Teaching/classroom experience is more important than using manualized methods.") on a 5-point continuum from 0 (not at all) to 4 (to a very great extent). Originally created for use in mental health settings, this scale provides a quantitative assessment of provider attitudes and allows for the assessment of provider willingness to adopt new practices (Aarons, et al., 2010).

Scores yielded by the EBPAS can be divided into four subscales: Requirements, Appeal, Openness and Divergence, as well as an overall Total Scale Score. The Requirements subscale assesses a provider's willingness to adopt EBPs if required to do so by administrators or directors. The Appeal subscale measures how much a provider finds EBPs intuitively appealing. The Openness subscale measures the level of openness of a provider to adopt EBPs, and the Divergence subscale measures how much the adoption of EBPs and academically-based interventions diverges with a provider's current practice. The Total Scale score provides a global understanding of a provider's acceptance of EBPs (Aarons, 2005).

Moderate to good internal consistency/reliability has been shown for the total score (Cronbach's α = .77 and .79) and subscale scores, excluding divergence (Cronbach's α = .78 - .93). The divergence subscale yielded slightly lower reliability estimates (Cronbach's α = .59 and .66) (Aarons, 2004; Aarons, 2007). Construct and convergent validity studies have focused on associations between the EBPAS and mental health clinic structure and policies

(Aarons, 2004), culture and organizational climate (Aarons & Sawitzky, 2006), as well as leadership (Aarons, 2006).

Autism Diagnostic Observational Schedule (ADOS)

The Autism Diagnostic Observational Schedule (ADOS) is a semi-structured assessment that evaluates the three core components of autism; communication and language, reciprocal social interactions, and restricted and repetitive behaviors or interests (Lord et al., 2000). A play-based observational assessment, this tool provides structured prompts of engagement with the examiner, with the expectation that these prompts will elicit specific desired behaviors. For this study, Modules 1 and 2 were predominately used, though 3 was also used on occasion. Module 1 is used for nonverbal children, and Module 2 is used for children with some speech, but not fluent conversations. Module 3 is used for young children with fluent language. The ADOS has sound reliability and validity, and its algorithm is both sensitive and specific in identifying children whose behaviors do or do not meet criteria for an ASD diagnosis. Though multiple modules exist, an autism severity score that can allow for the comparison of behavioral ratings across modules, regardless of the child's level of spoken language, was utilized to compare scores of children included in this study (Gotham, Pickles, & Lord, 2006).

Mullen Scales of Early Learning

The Mullen Scales of Early Learning (Mullen, 1995) is a norm-referenced measure of cognitive and developmental functioning for individuals from birth to 68 months. It is comprised of five subscales, including Gross Motor, Fine Motor, Expressive Language, Receptive Language, and Visual Reception. The gross motor scale is only administered to children younger than 33 months, but the four other cognitive scales are given through age 68 months. For this particular study, the use of the Early Learning Composite (ELC) was used, as it aggregates all scale scores except for the gross motor scale. The ELC is expressed

as a standard score (Mean = 100, SD= 15) and provides a standardized assessment of developmental functioning (Mullen, 1995).

The Mullen Scales have internal consistency coefficients ranging from 0.75 to 0.83 for the subscales, and a coefficient of .91 for the composite scaled score. The Mullen scales have been used for over a decade in research and clinical settings, and are a well established and accepted measure of different facets of children's cognitive functioning and development (Mullen, 1995).

Preschool Language Scale-4 (PLS-4)

The Preschool Language Scale-4 (PLS-4) is a widely used assessment geared toward the evaluation of language disorders and delays in preschool aged children (Zimmerman, Steiner, & Pond, 2002). This measure is also often used to evaluate changes in language skills over time. The PLS-4 has two subscales, Auditory Comprehension and Expressive Communication, and yields subscale specific scores as well as a total score (comprised of the two subscales).

The PLS-4 is a norm-referenced instrument used in education and research settings. Reliability coefficients for the Auditory Comprehension and Expressive Communication subscales are .90 and .93, respectively. The total scale score has a reliability coefficient of .95; therefore these scales are widely utilized for diagnostic testing (Zimmerman, Steiner, & Pond, 2002). In this study, the Total Score was used in all analyses. This score is comprised of both the Auditory Comprehension and Expressive Communication scaled scores, and is expressed as a standard score (Mean = 100, SD = 15).

Classroom Demographics Form

A study-generated demographics form was used to collect information regarding each teacher, including their level of education, race, and ethnicity (see Table 1). To better understand the demographics of the teachers in this research study, information was

included regarding how many years the teacher had been teaching (Table 2), how many

years the teacher had been teaching in a classroom for children with autism (Table 3).

Chapter 4: Analytical Plan

Multilevel modeling (MLM) was used to account for the nested structure of the data (e.g. children are nested in classrooms), as well as to understand the effects of teacher attitudes toward the use of EBPs on child outcomes in three domains, including autism severity (AS), language development (LD) and cognitive functioning (CF). A series of two-level models were estimated using HLM Version 6.0 to examine the effects of the child-level variables at the beginning of the school year (PRE) and teacher-level attitudes (TA) on children's outcomes at the end of the school year (POST). Three separate models were constructed for each of the child variables of interest (AS, LD, and CF).

First, an unconditional model was analyzed for each domain to determine the overall distribution of variance in the child-level outcomes attributable to the variability due to differences between children within classrooms (Level 1), and variability across classrooms (Level 2). Subsequently, child-level variables (AS, LD or CF) were entered at Level 1 to control for children's scores in these domains at PRE, and the teacher-level variable of teacher attitudes (TA) was entered at Level 2 as a predictor of a student's POST outcome in each model.

In the Level 1 equation, the child-level outcome (POST AS, LD, or CF) score (Y) for a child (i) who is in classroom (j) is a function of the intercept (β_{0j}; the POST AS, LD, or CF mean score for children within classrooms), the regression coefficients associated with the child score on PRE AS, LD, or CF (β_{1j}) and the Level 1 error term associated with residual of the POST score (r_{ij}). In the Level 2 equations, the intercept (β_{0j}) is a function of the overall mean of scores across classrooms for POST AS, LD, or CF scores (γ_{00}), the regression coefficient associated with teacher attitudes toward EBPs (γ_{01}), and the error term associated with the intercept (u_{0j}). The second Level 2 equation for the regression coefficient for the PRE score (β_{1j}) is made up of the estimated mean differences in the PRE

AS, LD, or CF score across classrooms (γ_{10}) and its corresponding error term (u_{1j}).

Overall Model Applied to Each Research Question:

$$\text{Level 1:} \qquad Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij}) + r_{ij}$$

$$\text{Level 2:} \qquad \beta_{0j} = \gamma_{00} + \gamma_{01}(W_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

<u>Research Question 1:</u>

Level 1: POST Autism Severity = $\beta_{0j} + \beta_{1j}$ (PRE Autism Severity) + r_{ij}

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$(Teacher Attitudes) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

Where:

β_{0j} = Overall Mean of AS $\qquad\qquad$ γ_{00} = Classroom Mean of AS

β_{1j} = Regression Coefficient of PRE AS $\qquad$ γ_{01} = Regression Coefficient for TA

r_{ij} = Error Term $\qquad\qquad\qquad\qquad\qquad$ u_{1j} = Error Term

<u>Research Question 2:</u>

Level 1: POST Language Development = $\beta_{0j} + \beta_{1j}$ (PRE Language Development) + r_{ij}

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$(Teacher Attitudes) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

Where:

β_{0j} = Overall Mean of LD $\qquad\qquad$ γ_{00} = Classroom Mean of AS

β_{1j} = Regression Coefficient of PRE LD $\qquad$ γ_{01} = Regression Coefficient for TA

r_{ij} = Error Term $\qquad\qquad\qquad\qquad\qquad$ u_{1j} = Error Term

<u>Research Question 3:</u>

Level 1: POST Cognitive Functioning = $\beta_{0j} + \beta_{1j}$ (PRE Cognitive Functioning) + r_{ij}

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$(Teacher Attitudes) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

Where:

β_{0j} = Overall Mean of CF γ_{00} = Classroom Mean of CF

β_{1j} = Regression Coefficient of PRE CF γ_{01} = Regression Coefficient for TA

r_{ij} = Error Term u_{1j} = Error Term

Calculating the Intraclass Correlation (ICC)

As mentioned above, the first step in MLM involves calculating an unconditional model to determine the overall distribution of variance in the child-level outcomes attributable to the variability between children *within* classrooms (Level 1) and variability due to differences *across* classrooms (Level 2).

This unconditional model also provides information used to calculate the Intraclass Correlation (ICC), which provides a measure of how similar children are within classrooms (McCoach & Adelson, 2010). The ICC is calculated by dividing the within-classroom variability (τ_{00}) by the total variability ($\tau_{00} + \sigma^2$).

Chapter 5: Results

To ensure the normal distribution of data, each variable was examined for outliers, homoscedasticity, and kurtosis. No assumptions were found to be violated. Table 7 includes descriptive statistics for both child- and teacher-level variables, respectively. Prior to the use of MLM, repeated measures t tests were used to determine whether or not a statistically significant change was occurring for all students from the beginning of the school year to the end of the school year, regardless of classroom setting. Results indicated that in all three areas of functioning (AS, LD, & CF) statistically significant differences were found between pre and post scores in this sample of students, indicating that significant gains were shown from the beginning to the end of the school year.

To test for significant change from the beginning to the end of the school year, a dummy variable for time was entered at level 1 (0= PRE, 1=POST). Significant change was noted for AS, β = -0.408, SE = 0.137, t(89) = -2.967, p = 0.004. ADOS severity scores at the end of the school year (M= 6.93, SD = 1.84) were significantly less than ADOS severity scores at the beginning of the year (M= 7.30, SD = 1.68), indicating an overall reduction in autism symptom severity. Significant change was also noted for LD, β = 6.936, SE = 0.915, t(89) = 7.585, p = <.001. PLS-4 scores at the end of the school year (M = 72.88, SD = 24.37) were significantly higher than PLS-4 scores at the beginning of the year (M = 65.48, SD = 19.31), indicating an overall increase in language abilities. Finally, significant change was noted for CF, β = 3.93, SE = 0.950, t(53) = -0.395, p = <.001. Mullen scores at the end of the school year (M = 66.54, SD = 19.42) were significantly higher than the Mullen scores at the beginning of the year (M = 64.90, SD = 19.57), indicating an overall increase in cognitive functioning. See Table 7 for descriptive statistics for these measures. Since scores provided evidence of change across the school year, we then wanted to take the analyses a step further to determine if there was evidence of significant classroom-level differences.

First, the initial unconditional models were examined to ensure that a significant proportion of the variance in each outcome measure (AS, LD, and CF) was attributable to differences across teachers, while controlling for each child's pre score on measures of AS, LD, and CF. This allowed us to better understand the proportion of the variance of a child's change score over time that can be attributed to the classroom teacher. This also justifies the use of multilevel modeling as the most appropriate analytic approach (Roudenbush & Bryk, 2002). For autism severity, 11.5% of the variance in scores was attributable to teacher-level differences. For language development, 15.2% of the variance in scores was attributable to teacher-level differences. When looking at cognitive functioning, none of the variance in scores was attributable to teacher-level differences. This finding means that the change in each child's cognitive development across the school year was not uniquely different based on the teacher to which they were assigned. Therefore, MLM analyses were not conducted for the cognitive functioning domain.

Autism Severity (AS)

To investigate the impact of teacher attitudes on student autism severity, the teacher independent variable (EBPAS) was used as a predictor of the intercept of the child-level independent variable (AS). We found no significant relationship, $\beta = -0.110$, SE = 0.279, $t(49) = -0.395$, $p = 0.694$, indicating teacher attitudes at the beginning of the school year did not have a significant impact on the change in a child's autism severity from the beginning to the end of the school year. See Table 8 for a summary of these results.

Language Development (LD)

To investigate the impact of teacher attitudes on student language development, the teacher independent variable (EBPAS) was used as a predictor of the intercept of the child-level independent variable (LD). We found no significant relationship, $\beta = -0.774$, SE =3.323, $t(50) = -0.233$, $p = 0.817$, indicating teacher attitudes at the beginning of the year toward

the use of evidence-based practices did not have a significant impact on a child's language development from the beginning to the end of the school year. See Table 8 for a summary of these results.

Chapter 6: Discussion

Children with ASD present with unique and often times challenging behaviors for teachers to address, though the methods by which teachers can most effectively educate these children have slowly turned to a more evidence-based approach. Though no "gold-standard" educational practices have been established to date, many EBPs show promise in effectively managing circumscribed and repetitive behaviors, increasing language acquisition, and increasing social awareness (Rogers & Vismara, 2008). While EBPs may yield gains across critical domains of functioning, it is unclear at this point whether or not the individual implementing those EBPs, or that particular individual's attitudes toward adopting EBPs, has any significant impact on the children being taught.

It was expected that this study would show that high quality teachers who had more favorable attitudes toward adopting EBPs would have a more significant impact on the overall learning of the students they teach. Additionally, we expected that more favorable attitudes would relate to lower levels of student autism severity at the end of the school year. We also expected that teachers with more favorable attitudes toward EBPs would be significantly correlated with improved language and cognitive outcomes of their students at the end of the school year. In short, we expected better overall outcomes for students who were in classrooms with teachers who had more favorable opinions toward EBPs.

These hypotheses were not supported by the present study, though this should not be seen as a necessarily unfavorable result. Because students in this study, on average, demonstrated significant improvements over the course of the year in classrooms using evidence-based instructional practices, the use of EBPs in educating students with autism is once again supported (e.g. Odom, et al., 2010; Simpson, 2005). Data from this sample did not support our hypotheses that there would be teacher-level effects on student outcomes, indicating that within our particular sample of teachers, no differences in teacher attitudes

led to differences in student outcomes. This again highlights the idea that regardless of the evidence-based approach implemented in a classroom, if skilled teachers implement EBPs at a high level of fidelity, the students in their classrooms are likely to show significant gains across the school year.

As discussed previously, it is important to note that all teachers were intentionally screened into this study at a high level of fidelity of implementation of their EBPs. Therefore, it is possible that additional factors should be taken into account to explain the findings outlined above. First, high fidelity teachers may all have generally favorable attitudes about the use of EBPs in their classrooms, as these have been the practices that have guided their instruction for several years. It is thought that a random sampling of teachers (including those who may not be implementing their specific model or EBPs at a high level of fidelity) may yield more significant variability in beliefs and attitudes about EBPs.

Teachers were required to teach in a classroom for children with autism for a minimum of two years prior to their participation in this study, so it is probable that these teachers have all already undergone the extensive training and have been provided with a thorough rationale as to why EBPs are important to implement when educating children with autism. Teachers in this study were required to implement their models at a high level of fidelity, and were expected to attend a booster training prior to their participation in this study. Given the specificity of inclusionary criteria used to select this sample of teachers, these teachers' attitudes towards EBPs may not be as variable as one might expect given a random sampling of teachers.

Additionally, we expect that the homogeneity of the teacher sample (all high fidelity teachers) possibly contributed to the lack of variability in the children's outcome scores. It is thought that a more diverse sample of teachers of children with ASD (again, those who

have not spent as long teaching in the field of autism or those who have not had as much

experience with EBPs) may yield greater variability in student outcomes. We provide

evidence which suggests that high fidelity teachers contribute to significant gains in child

outcomes across the school year, but studies conducted with teachers who are

implementing EBPs at varying levels of fidelity may yield different results all together.

It is also prudent to take into consideration the measures utilized to capture the

opinions of the teachers about EBPs. The EBPAS is a measure of teacher attitudes that can

be filled out quickly. A 15-item measure, the EBPAS can be completed in a short amount of

time which works well with a teacher's hectic schedule. Future researchers may consider

creating, validating, and subsequently utilizing a more in-depth measure that directly

assesses specific areas where teachers may endorse or disapprove of the practices they use.

Qualitative data may also be beneficial in further understanding the root of teachers'

attitudes toward EBPs, particularly in the early stages of new measurement development.

Future Directions

This study was the first of its kind to preliminarily examine the impact of teacher

attitudes on child outcomes in classrooms of students with ASD. While statistically

significant results were not gleaned from this particular sample, possibly due to the

specificity with which teachers and classrooms were screened into the study, many future

directions were uncovered. This particular dataset included participants from 2 of the 3

years of the larger parent project. Once data are available for the final year, it will be

important to include these additional data points in future analyses. A more robust data set

may shed light on possible associations not fully captured with a smaller sample of children.

While we expect a third year of data to trend in a similar fashion to those data presented in

this thesis, it would still be important to include additional participants in future analyses to

possibly increase the generalizability of future findings.

Throughout the course of this study, it was realized that the fidelity of implementation of a respective treatment model may in fact impact student outcomes in addition to, or above and beyond, teacher attitudes toward the adoption of EBPs. Since all teachers were screened into the study and expected to maintain a high level of fidelity of implementation of their respective treatment model, the impact of fidelity of implementation was not included in the current study's analyses. Future studies that include a more diverse sample of teachers should include a measure of the fidelity of implementation that can be included in analyses to account for how well a teacher is implementing his or her respective practice.

It is possible that certain limitations can be attributed to the specific aims of the parent study. TEACCH, LEAP, and BAU classrooms were used in the parent project, limiting the diversity of autism specific classrooms. For example, perhaps by including classrooms that used Applied Behavioral Analysis (Lovaas, 1987; *see* Matson, et al., 2012) as an established yet unique EBP, a more diverse sampling of autism-focused classrooms could be assessed. This would also allow researchers to sample from a wide array of classrooms where fidelity of implementation again may vary considerably.

Future studies with wider variability of the fidelity of implementation of EBPs may also yield data that can be analyzed using subscale scores of the EBPAS. By looking at subscales such as the Openness or Requirement subscale, future research may be able to identify specific aspects of teacher attitudes that more directly impact student outcomes across the school year. However, these analyses could be conducted in future studies should significant results be found for the influence of total EBPAS score on student outcome.

Conclusion

In conclusion, little research has focused on the impact of teacher attitudes on child outcomes in the school setting, and much research is still needed to fully understand this

relationship. While this study provides a basis on which future research can be structured, additional measures and considerations of sample heterogeneity and size could improve further research in this area. With the ever-advancing state of EBPs used in classroom settings, a better understanding of how teachers impact the outcomes of students in their classrooms is essential to providing the best education possible for children with ASD and their families.

Chapter 7: Tables

Table 1

Teacher Demographic Data

		N
Education	AA	4
	BS/BA	16
	MEd/MS/MA	27
	Above MEd/MS/MA	2
Ethnicity	non-Hispanic	40
	Hispanic	9
Race	White	49
	Bi/Multi	0
Gender	Female	48
	Male	1
Model	TEACCH	16
	LEAP	15
	BAU	18

Table 2

Teachers' Total Number of Years Teaching

Years Teaching	N
2	1
3	3
4	7
5	3
6	3
7	3
8	4
9	1
10	4
11	3
12	4
13	1
14	1
15	1
16	1
17	2
18	1
19	2
20	2
22	1
30	1

Table 3

Teachers' Total Number of Years Teaching in ASD

Years Teaching: ASD	N
2	4
3	8
4	11
5	7
6	2
7	4
8	2
9	1
10	1
12	4
13	2
17	1
20	1
22	1

Table 4

Child Demographic Data

		N
Ethnicity	non-Hispanic	85
	Hispanic	54
	Unreported	5
Race	White	110
	Bi/Multi	7
	Asian	8
	Black	14
	Unreported	5
Gender	Female	21
	Male	123

Table 5

Teacher Assessment Schedule

Name of Assessment	Pre	Time Point 1 (T$_1$)	Time Point 2 (T$_2$)	Time Point 3 (T$_3$)	Time Point 4 (T$_4$)	Post
Demographics	X					
EBPAS	X					X
Fidelity Screener		X	X	X	X	

Table 6

Student Assessment Schedule

Name of Assessment	Pre	Time Point 1 (T$_1$)	Time Point 2 (T$_2$)	Time Point 3 (T$_3$)	Time Point 4 (T$_4$)	Post
Demographics	X					
ADOS	X					X
Mullen	X					X
PLS-4	X					X

Table 7

Descriptive Statistics for Child and Classroom-Level Measures

Child Measures	n	M	SD	Minimum	Maximum
ADOS (PRE)	142	7.30	1.68	2	10
ADOS (POST)	118	6.93**	1.84	1	10
PLS-4 (PRE)	136	65.48	19.31	50	134
PLS-4 (POST)	129	72.88*	24.37	50	137
Mullen (PRE)	130	64.90	19.57	49	132
Mullen (POST)	114	66.54*	19.42	49	122
Teacher Measure	n	M	SD	Minimum	Maximum
EBPAS (PRE)	49	3.13	.422	1.73	3.87

Note: * indicates p< .001, ** indicates p< .05

Table 8

Multilevel Modeling Results (Fixed Effects)

Fixed Effect	Coefficient	Std Error	Df	T-Ratio	P-Value
Autism Severity	-0.110	0.279	49	-0.395	0.694
Language Development	-0.774	3.323	50	-0.233	0.817
Cognitive Functioning	0.836	1.350	47	0.619	0.538

Chapter 8: Appendix

Date: ☐☐ / ☐☐ / ☐☐   ID ☐☐☐

EBPAS (©Gregory A. Aarons, Ph.D.)
Evidence-Based Practice Attitude Scale (Teacher Version)

The following questions ask about your feelings about using new types of teaching methods, interventions, or treatments. Manualized teaching intervention refers to any intervention that has specific guidelines and/or components that are outlined in a manual and/or that are to be followed in a structured/predetermined way.

Fill in the circle indicating the extent to which you agree with each item using the following scale:

0	1	2	3	4
Not at All	To a Slight Extent	To a Moderate Extent	To a Great Extent	To a Very Great Extent

	0	1	2	3	4
1. I like to use new types of methods/interventions to help my students	○	○	○	○	○
2. I am willing to try new types of methods/interventions even if I have to follow a teaching/training manual	○	○	○	○	○
3. I know better than academic researchers how to care for my students	○	○	○	○	○
4. I am willing to use new and different types of methods/interventions developed by researchers	○	○	○	○	○
5. Research based teaching methods/interventions are not useful in practice	○	○	○	○	○
6. Teaching/classroom experience is more important than using manualized methods/treatm	○	○	○	○	○
7. I would not use manualized methods/interventions	○	○	○	○	○
8. I would try a new methods/intervention even if it were very different than what I am used to doing	○	○	○	○	○

For questions 9-15: If you received training in a teaching method or intervention that was new to you, how likely would you be to adopt it if:

	0	1	2	3	4
9. it was intuitively appealing?	○	○	○	○	○
10. it "made sense" to you?	○	○	○	○	○
11. it was required by your supervisor?	○	○	○	○	○
12. it was required by your school?	○	○	○	○	○
13. it was required by your state?	○	○	○	○	○
14. it was being used by colleagues who were happy with it?	○	○	○	○	○
15. you felt you had enough training to use it correctly?	○	○	○	○	○

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