COACHING TEACHING ASSISTANTS TO IMPLEMENT NATURALISTIC

BEHAVIORAL TEACHING STRATEGIES TO ENHANCE SOCIAL

COMMUNICATION SKILLS DURING PLAY

IN THE PRESCHOOL CLASSROOM

by

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DISSERTATION ABSTRACT

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Title: Coaching Teaching Assistants to Implement Naturalistic Behavioral Teaching Strategies to Enhance Social Communication Skills During Play in the Preschool Classroom

Naturalistic behavioral interventions increase the acquisition, generalization, and maintenance of child social communication skills among children with developmental delays (DD). Teaching Assistants (TAs) are ideal interventionists for delivering social communication interventions due to the significant amount of time they spend with children with DD in the preschool classroom. However, professional development for TAs is often inadequate and there is limited research in this area. In addition, TAs are often working with multiple children at a time with varying skill levels, but no research has been conducted on the use of strategies with more than one child. The study addresses gaps in the literature by answering the following questions: (1) Is there a functional relation between coaching TAs to use EMT and increases in TA's fidelity of implementation of EMT with a child dyad?; (2) Is there a functional relation between TA's use of EMT and increases in child social communication skills?; and (3) Are TAs able to generalize the use of EMT across students with varying social communication skills and goals? Results suggest coaching TAs contributes to increases in fidelity of implementation of EMT strategies and subsequent increases in child social communication skills. TAs were able to generalize the use of EMT across students.

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CHAPTER I

INTRODUCTION

Children with developmental delays (DD) are at an increased risk for delayed

social communication skills (Kaiser & Trent, 2007). These delays present significant

issues, since learning to communicate with social partners is a foundational skill for

young children that is closely linked to other developmental outcomes (Kaiser & Trent,

2007; McLelland, Morrison & Holmes, 2000; McLelland & Morrison, 2003). Due to the

importance of developing early social communication skills, early interventions for

language and communication are the most frequently recommended therapy for young

children with DD (Kaiser & Trent, 2007).

Early social communication skills provide the foundation for later cognitive,

social, and literacy related skills (Kaiser & Trent, 2007) that are necessary for

kindergarten readiness and future academic achievement (Cooper & Farran, 1998;

DeRosier, Kupersmidt, & Patterson, 1994; Foulks & Morrown, 1989; McLelland,

Morrison & Holmes, 2000; McLelland & Morrison, 2003). Furthermore, poor social

skills are frequently associated with peer rejection and challenging behavior (Cooper &

Farran, 1998; McLelland, Morrison & Holmes, 2000; McLelland & Morrison, 2003;

Sigafoos, 2000). Previous research suggests there is a strong relationship between social

communication difficulties and behavioral problems among individuals with

developmental delays (Bott, Farmer & Rhode, 1997; Matson, Boisjoli, & Mahan, 2009;

Sigafoos, 2000). Social communication difficulties also prevent young children from

engaging in meaningful social interactions with adults and peers, which may preclude

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them from accessing important learning opportunities in the natural environment, such as the preschool classroom (Kaiser & Trent, 2007; Wetherby & Woods, 2006).

Although there is substantial evidence supporting the efficacy of early interventions for teaching social communication skills to young children with DD (Kane, Connell & Pellechia, 2010; McConnell;, 2002; Reichow & Volkmar, 2009), this population of children often struggles with generalizing and maintaining newly learned social communication skills to everyday interactions in the natural environment (Grisham-Brown, Schuster, Hemmeter, & Collins, 2000; Lane, Leiberman, & Gast, 2016; Snyder, Rakap, Hemmeter & McLaughlin, 2015). Therefore, it is especially important to target the generalization and maintenance of social communication skills to ensure the sustainability of early intervention in natural settings. When young children can use social communication skills effectively in the preschool classroom, they have more occasions to interact with peers and adults, leading to greater access to valuable learning opportunities (Koegel & Koegel, 1995).

Due to the difficulties children with DD experience with skill generalization, researchers recommend interventions that promote generalization in natural settings (Dunst, Bruder, & Hanby, 2006; Sandall, McLean, & Smith, 2000; Schreibman, Dawson, Stahmer, Landa, Rogers, McGee, Kasari, Bruinsma & McNerney, 2015; Odom & Wolery, 2003). More traditional approaches involving children being taken out of their classroom and being taught with one-to-one instructional approaches (i.e., one child and one teacher or specialist) are likely to have limited sustainability (Bottema-Beutel, Yoder, Woynaroski, & Sandbank, 2014; Cowan & Allen, 2007; Delprato, 2001; Schreibman, Dawson & Stahmer, 2015). However, naturalistic instructional approaches delivered by

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individuals the child regularly interacts with in their natural environment, such as direct service providers in the preschool classroom, may facilitate the generalization and maintenance of skills (e.g., Cowan & Allen, 2007; Ingersoll, Dykstra, Whalen, & Sikora, 2005; Kaiser & Hester, 1994).

Implementing naturalistic behavioral interventions in the preschool classroom during center-based play with support from Teaching Assistants (TAs) may be especially useful for supporting generalized social communication skills among preschool children with DD, since preschool children spend a significant part of their day supervised by TAs during play activities (Giangreco, Edelman, Broer, & Doyle, 2001; Giangreco, Doyle, & Suter, 2012). A rationale for the use of naturalistic behavioral interventions and professional development for TAs on the use of naturalistic behavioral teaching strategies is described.

Naturalistic behavioral interventions

In the past three decades, an extensive body of research has supported the use of naturalistic behavioral interventions for improving communication and social behavior, suggesting these teaching procedures can be implemented with fidelity by therapists, parents, and teachers in a variety of settings including clinics, homes, and schools (e.g., Kasari et al., 2014; Wetherby et al., 2014). Naturalistic behavioral interventions use incidental teaching approaches to facilitate language and social communication development. Although a variety of other terms have been used elsewhere to refer to naturalistic behavioral interventions (e.g., naturalistic developmental behavioral intervention; NDBI, naturalistic language intervention, incidental teaching), for the purpose of this paper, all similar strategies will be referred to as naturalistic behavioral

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interventions. In addition, several multicomponent interventions mentioned in the

literature can be characterized by the use of naturalistic behavioral teaching strategies

(e.g., Enhanced Milieu Teaching; EMT, Pivotal Response Training; PRT, Natural

Language Paradigm; NLP), but these interventions share common features and teaching

components and will collectively be referred to as naturalistic behavioral interventions in

this manuscript.

Naturalistic behavioral interventions include a combination of procedures from

the applied behavior analysis (ABA) and developmental literature (Schreibman, Dawson

& Stahmer, 2015). They were developed to address some of the limitations presented by

more traditional, highly structured ABA interventions such as Discrete Trial Training

(DTT). Although DTT has been proven to be effective in teaching social communication

skills (e.g., Carr & Dores, 1981; Prizant, Wetherby, Rydell, Wetherby, & Prizant, 2000;

Smith, Groen, & Wynn, 2000), research suggests these strategies fail to promote the

generalization of newly learned skills across multiple environments and circumstances,

and do not elicit spontaneous social communication acts (Bottema-Beutel et al., 2014;

Cowan & Allen, 2007; Delprato, 2001; Schreibman et al., 2015). Providing instruction in

highly controlled settings leads to responding that is under the control of limited and

highly specific stimuli (Delprato, 2001; Cowan & Allen, 2007), therefore responding will

not likely transfer to other stimuli in the natural environment. In addition, these

procedures are often associated with the presence of escape and avoidance motivated

challenging behavior and an overdependence on adult prompts (Delprato, 2001; Cowan

& Allen, 2007, Schreibman et al., 2005). In response to these limitations, investigators

have drawn from advances in the developmental sciences in an effort to advance

traditional behavioral methodologies to increase generalization, maintenance and spontaneity of skills, as well as reduce challenging behavior and prompt dependency (Bottema-Beutel et al., 2014; Cowan & Allen, 2007; Schreibman et al., 2015). Naturalistic procedures are more likely to promote generalization, since they utilize diverse and varied stimuli, reinforce a variety of acceptable response and include naturally occurring reinforcers that are functionally related to the stimulus (e.g., if the student points to a yellow block they get a yellow block), thereby limiting the need to fade artificial reinforcement, (Delprato, 2001; Cowan & Allen, 2007).

Previous research suggests naturalistic behavioral interventions are especially effective in promoting social communication skills among children with social communication delays (Kane et al., 2010; Schreibman, et al., 2015; Snyder et al., 2015), supporting their access to the general education preschool curriculum and providing individual instruction in the context of typical classroom activities and routines (Snyder et al., 2005). Naturalistic instructional approaches have not only been associated with increased child engagement (e.g., Jones, Carr, & Feeley, 2006; Kohker, Anthony & Steighner, 2001; McGee, 2002) and skill acquisition (e.g., Endicott & Higbee, 2007; McCathren, 2000; Robbins, 2012), but there is also evidence to suggest they support the generalization of newly learned skills (e.g., Fox & Hanline, 1983; Endicott & Higbee, 2007; McGee & Daly, 2007) and reduce escape and avoidance motivated challenging behavior (e.g., Koegel et al., 1987). The supportive evidence from previous research has led to naturalistic behavioral interventions being widely recommended for targeting social and communication outcomes among children with DD (e.g., DEC, 2014; Cowan

& Allen, 2007; Bottema-Beutal et al., 2014; Schreibman et al., 2015; Wong, Odom, Hume, Cox, Fettig, Kucharczyk,…& Schultz, 2015).

Paraprofessional support

Paraprofessionals, particularly TAs, are especially suitable intervention agents for delivering naturalistic behavioral interventions in the preschool classroom because it has increasingly become common practice for paraprofessionals to provide support to children with disabilities in inclusive environments (Giangreco & Broer, 2007; Hughes & Valle-Riestra, 2008; Keller, Bucholz, & Brady, 2007) due to an increasing number of children with disabilities in the general education classroom (Boyle, Boulet, Schieve, Cohen, Blumberg, Yeargin-Allsop,…& Cohen, 2011; Loiacano & Vallenti, 2010). In fact, paraprofessionals frequently serve as the primary interventionist in inclusive early childhood settings (Hammeken, 1996; Blacher & Rodriguez, 2007). This reliance on paraprofessional support is expected to continue, owing to special education teacher shortages and budgetary constraints (Brownell, Sindelar-Bishop, Langley, & Seo, 2002; Giangreco & Broer, 2007; Ryndack, Clark, Conroy, & Stuart, 2001; Salzberg & Morgan, 1995).

The substantial role of paraprofessionals in the current educational system is reflected in federal policies. The 1997 Amendment to the Individuals with Disabilities Education Act (IDEA; 2004) allows appropriately trained paraprofessionals to assist in the provision of special education and related services (Part B of IDEA) and early intervention services (Part C of IDEA). In addition, IDEA and No Child Left Behind (NCLB) legislation requires local agencies to ensure that paraprofessionals are

adequately and appropriately trained (Killoran, Piazza Templeman, Peters, & Udell, 2001; Yell & Drasgow, 2005).

Unfortunately, a majority of paraprofessionals do not have the required training and supervision to deliver effective interventions for students with DD (Carter, O'Rourke, Sisco, & Pelsue, 2009; Giangreco, Broer, & Edelman, 1999; Hilton & Gerlach, 1997), which may contribute to poor educational outcomes (French, 2004; Giangreco, Edelman, Luiselli, & McFarland, 1997; Marks, Schrader, & Levine, 1999). Previous literature suggests pre-service training is largely either unavailable or inadequate, and in-service training is limited and inconsistently available (Hall, Grundon, Pope, & Romero, 201)0). In some instances, paraprofessionals receive no training before beginning their classroom responsibilities (Passaro, Pickett, Latham, & HongBo, 1994; Riggs, 2001).

In previous research, paraprofessionals have identified several training and support needs (e.g., Killoran et al., 2001; Riggs, 1991; Riggs, 2001), suggesting they may not feel adequately prepared for their roles as direct service providers. For example, in survey research with 200 paraprofessionals (Riggs, 2001), respondents indicated small group instruction and specific instructional strategies among the highest perceived needs for training. In another study with 64 paraprofessionals (Killoran et al., 2001), 60% of respondents identified competencies related to service delivery and teaching among their highest training needs. These competencies include: (a) knowledge of best practices in EI/ECSE; (b) ability to create appropriate and stimulating environments to enhance learning; (c) ability to effectively communicate with children; (d) ability to effectively integrate effective therapeutic practices into learning environments; (e) ability to

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appropriately monitor child progress and make program changes (Killoran et al., 2001).

Results from survey research indicate that supporting paraprofessionals, such as TAs, in the implementation of evidence-based instructional strategies in the preschool classroom, especially within small groups, is a high priority for professional development.

Didactic workshops are currently the most popular format for paraprofessional development, but overreliance on pre-service workshops is problematic, since they do not produce adequate or permanent behavior change (Gianrgreco & Doyle, 2004; Han & Weiss, 2005; Rose & Church, 1998; Schepis, Reid, Ownbey & Clark, 2003; Tate, Thompson, & McKerchar, 2005; Watson & Kramer, 1995). Furthermore, newly acquired skills learned during workshops may not generalize to real word situations (Parsons, Rollyson, & Reid, 2012; Smith, Parker, Taubman & Lovaas, 1992), such as working with small groups of children with various educational needs in the preschool classroom.

Implementation in the preschool classroom

Center-based play is one real-world situation in which TAs might benefit from additional support, since play provides rich opportunities for embedded instruction (Hemmeter, 2000; Wolery & Hemmeter, 2011). Center-based play involves playing at defined centers within the classroom, arranged with developmentally appropriate and engaging materials that build upon the child's interests and experiences to promote active participation. Center-based play is an appropriate daily activity in which to target social communication skills, since preschool children spend a significant portion of their day occupied in play and children are more motivated to learn when they are highly engaged in the activity (Hemmeter, 2000; Snyder et al., 2015). In fact, current recommendations for early intervention include providing services in a play-based format in typical settings

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(DEC, 2014; Wolery & Hemmeter, 2011). However, many of the adults in preschool classrooms are not using effective language facilitation strategies in the classroom during play, suggesting the need for more training (Girolametto, Hoaken, Weitzman, & Van Lieshout, 2000; Girolametto & Weitzman, 2002).

Summary

This chapter provided a rationale for the proposed research study. Current issues in professional development will be addressed by examining the effects of coaching TAs to implement naturalistic behavioral interventions in preschool classroom in order to increase TA's fidelity of implementation of effective teaching strategies, thereby improving child social communication outcomes. A review of the literature addressing the implementation of naturalistic behavioral interventions in preschool classrooms and professional development for TAs in preschool settings will be provided in the subsequent chapter.

Chapter II

LITERATURE REVIEW

Introduction

The purpose of this chapter is to summarize and identify gaps in the literature related to implementing naturalistic behavioral interventions in early childhood education settings with natural change agents. An argument for the current investigation and proposed methods is presented. A rationale for using naturalistic behavioral interventions to target child social communication skills is provided. A review of the literature on the implementation of naturalistic behavioral interventions in preschool classrooms, in addition to a review of the literature on coaching paraprofessionals to implement interventions is presented. Finally, a description of the proposed research and how it will address the identified gaps in the literature is given.

A large body of evidence supports the effectiveness of naturalistic behavioral interventions for improving child social communication skills (Schreibman et al., 2015; Kane, Conell, & Pellechia, 2010; Lane, Lieberman, & Gast, 2016) and supporting the generalization and maintenance of newly learned skills (Kane et al., 2010; Schreibman et al., 2015). However, there remain gaps in the literature, specifically regarding the implementation of naturalistic behavioral interventions in preschool settings during daily classroom activities. The following literature review identifies some of those gaps and provides recommendations for future research by addressing the following questions: (1) What is the effectiveness of implementing naturalistic behavioral interventions in preschool classrooms to improve child social communication outcomes; (2) What intervention agents have been trained to implement naturalistic behavioral interventions

in preschool classrooms; and (3) What methods have been used to coach

paraprofessionals to implement teaching strategies?

Review Methods

Previous systematic reviews of the literature on the implementation of naturalistic

behavioral interventions were conducted using PsychInfo, ERIC, and Academic Search

Premier using the following search terms: "naturalistic language intervention", incidental

teaching", "naturalistic behavioral intervention" "naturalistic developmental behavioral

intervention" and "naturalistic instruction" combined with "review". "Preschool

classroom" was then added to each search combination. Studies were extracted from

previous reviews that targeted child social communication skills and were implemented

with children ages 3-5 in preschool classrooms. An additional search was not conducted,

since the last review was published in 2016.

Previous systematic reviews of the literature on coaching paraprofessionals were

also conducted to determine what coaching strategies are effective. A search was

conducted using PsychInfo, ERIC and Academic Search Premier using the following

search terms: "coaching" "training" and "professional development" combined with

"paraprofessionals" and "teaching assistants" and "paraeducators" combined with

"literature review". An additional search was then conducted using the same databases

on the missing years from the previous reviews using the following terms: "coaching"

and "training" combined with "paraprofessionals", "teaching assistants" and

"paraeducators."

Use of Naturalistic Behavioral Interventions in Preschool Classrooms

Several previous literature reviews have provided support for the effectiveness of naturalistic behavioral interventions (Bozkus & Vuran, 2013; Brunner & HyeKyeung, 2009; Kane et al., 2010; Lane et al., 2016; Snyder et al., 2015). For example, Kane and colleagues (2010) conducted a meta-analysis of the literature to evaluate the effectiveness of interventions targeting expressive language skills among children with autism. They examined twenty-one studies published in peer-reviewed journals between 1981 and 2007. The authors used mean percentage of non-overlapping data (PND) scores to evaluate the effects of the reviewed studies. The results of the meta-analysis suggest naturalistic behavioral interventions were effective at promoting skill acquisition, generalization and maintenance. Only four of the included studies were conducted in preschool classrooms (Endicott & Higbee, 2007; McGee, Almeida, Sultzer-Azaroff & Feldmman, 1992; McGee & Daly, 2007). None of these studies used paraprofessionals to deliver the intervention.

In another review of the literature, Brunner & HyeKyeung (2009) analyzed communication-based treatments targeting pre-linguistic skills, language, and other social pragmatic outcomes. They reviewed a total of thirty-six studies published between 2002-2007; only one study evaluated the efficacy of a naturalistic behavioral intervention implemented in a preschool classroom (Jones et al., 2006). None of the reviewed studies used paraprofessionals as intervention agents.

Bozkus and Vuran (2013) conducted a review of the literature on the use of PRT to increase social skills. They reviewed twenty-three studies published between 1987 and 2009; only three were conducted in classrooms with preschool children (Robinson, 2011;

Jones et al., 2006; Stahmer, 1995). Only one study (Robinson, 2011) investigated the effects of a naturalistic behavioral intervention implemented by TAs.

Snyder and colleagues (2015) conducted a systematic review of the literature summarizing naturalistic instructional approaches for preschool children implemented in preschool classrooms. They reviewed forty-three studies published between 1981 and 2013. Ten studies used naturalistic behavioral teaching strategies to promote child social communication outcomes (Christensen-Sandfort & Whinnery, 2013; Halle et al., 1981; Harjusola-Webb & Robbins, 2012; Kohler et al., 2001; Malmskog and McDonnell, 1999; McCathren, 2000; McBride & Schwartz, 2003; Mudd & Wolery, 1987; Olive, de la Cruz, Davis, Chan, Lang, O'Reilly, & Dickson, 2007). Only one of these studies examined the use of paraprofessionals as intervention agents (Olive et al., 2007). Frequently used naturalistic behavioral teaching strategies from the reviewed studies included planned environmental arrangements, language expansions, mand model, time delay, least-to-most prompting, most-to-least prompting, and consequent strategies. The results of the review provide support for the use of naturalistic behavioral interventions in helping preschool children with DD acquire target skills (Snyder et al., 2015).

In the most recent review of the literature, Lane et al. (2016) analyzed naturalistic behavioral interventions for increasing spontaneous expressive language in children with ASD. They examined the methodological rigor and effectiveness of each study using WhatWorks Clearinghouse (WWC) guidelines. They reviewed at total of twenty-four studies published between 1987 and 2013. Only one of these studies was implemented in a preschool classroom (Christensen-Sandfort & Whinnery, 2013) with teachers as the intervention agent. The results of the review suggest that effective interventions used

environmental arrangement strategies, time delay procedures, systematic prompting procedures, and consequent strategies.

Although there is strong support for naturalistic behavioral interventions for increasing social communication skills, there is still limited research on the use of naturalistic behavioral interventions in preschool classrooms with natural change agents. In addition, only two of the reviewed studies (Olive et al., 2007; Robinson, 2011) evaluate the implementation naturalistic behavioral interventions by paraprofessionals in the preschool classroom. *Table 1* provides a summary of studies implementing naturalistic behavioral interventions in preschool classrooms. Although the findings from these studies are promising, they are limited by methodological weaknesses that compromise the demonstration of a functional relation between the intervention and child outcomes. Future research should measure treatment fidelity and procedural fidelity, define coaching procedures, measure both adult and child outcomes, and include generalization and maintenance probes.

Table 1

Naturalistic Behavioral Interventions in the Preschool Classroom

Study	Design	Child participants	Intervention agent	Outcomes	Limitations
Christensen -Sandfort & Whinnery (2013)	ABA design	Four preschool children with development al disabilities	Teachers	Increased correct use of teaching strategies. Increased prompted vocal responses for child participants. Minimal increases in spontaneous vocal responses for child participants.	Highly variable data for both child and adult participants. Significant overlap in data between phases for both child and adult participants. No generalization or maintenance data.
Endicott & Higbee (2007)	MBL across participants	Three preschool males with ASD	Graduate-level students	Increased mands for information for child participants with generalization to the home setting.	Only three baseline data points for the first participant and high variability in data for the third participant. Limited generalization probes. Treatment fidelity not reported.
Fox & Hanline (1983)	Multiple probe design across behaviors	One 4-year old male with develop-mental delays	Trained inter-ventionist	Increased tacting and conversational turns among students with generalization across people and settings. Results were maintained.	Multiple probe design limits demonstration of a functional relation. Treatment fidelity was not measured. Increases in child requesting were not immediate.

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Table 1 (Contd)

Naturalistic Behavioral Interventions in the Preschool Classroom

Study	Design	Child Participants	Intervention Agent	Outcomes	Limitations
Hall et al. (2010)	MBL across settings	No child participants	Para-professional	Generalization of PRT strategies	Child outcomes not measured.
Halle et al. (1981)	MBL across participants	Six preschool children with develop-mental delays	Teachers	Increased use of teaching strategies with generalization to untrained opportunities. Increased student vocal initiations.	Limited maintenance of teachers' use of teaching strategies.
Harjusola-Webb & Robins (2012)	MBL across participants	Four preschool children with ASD	Teachers	Increased use of teaching strategies. Increased student frequency of expressive communication.	No measurement of generalization or maintenance of teachers' use of teaching strategies.
Jones et al. (2006)	MBL across participants	Five preschool children with ASD	Parents and teachers	Increased use of teaching strategies. Increases in child joint attention. Improvements in child expressive language.	No measurement of generalization or maintenance of teachers' use of teaching strategies.
Kohler et al. (2001)	MBL across participants	Four preschool children with autism or PDD	Teachers	Increase in teacher's use of strategies. Increased social interactions for target children with maintenance.	High variability in teacher's use of strategies. No generalization probes taken.

Table 1 (Cont)

Naturalistic Behavioral Interventions in the Preschool Classroom

Study	Design	Child Participants	Intervention Agent	Outcomes	Limitations
McBride & Schwartz (2003)	MBL across participants	Three preschool children with development al disabilities	Teachers	Increased use of intervention strategies by teachers only after using a discrete trial format, but not after using an activity base intervention alone. Increased correct responses for target children when the discrete trial condition was added.	Limited generalizability of teacher's use of naturalistic teaching strategies.
McCathren (2000)	MBL across behaviors	One 3-year old male with severe communicati on and cognitive delays	Special Education teacher	Increased use of intervention strategies by teacher. Increased child social communication skills.	No measurement of generalization or maintenance of teachers' use of teaching strategies.
McGee et al. (1992)	MBL across participants	Three males with autism (3-5 years)	Peers	Increased reciprocal peer interactions for child participants.	Highly variable data for all participants during intervention and some overlap in data for the third participant. No generalization or follow-up data. Treatment fidelity data not reported.

Table 1 (Cont)

Naturalistic Behavioral Interventions in the Preschool Classroom

Study	Design	Participants	Intervention Agent	Outcomes	Limitations
McGee & Daly (2007)	MBL across participants	Three males with autism (3-5 years)	Bachelor's level research assistant and teacher	Increased use of social phrases for child participants. Some generalization across activities for all participants and generalization to novel teacher for some participants.	Highly variable data and some overlap in data for all participants. Delay in use of social phrases during unprompted sessions for 2 of the participants. Fidelity of implementation not reported.
Mudd & Wolery (1987)	MBL across participants	Seven males and thirteen females with disabilities (48-74 months)	Teachers	Increased use of teaching strategies among teacher participants with maintenance.	High variability and overlapping data between phases for two of the teacher participants. Child outcomes were not measured.
Olive et al. (2007)	Multiple probe design across participants	Three males with autism (3-5 years)	Teachers and teaching assistants	Increased prompted and independent use of a speech generating device for one participant and increased requests for two participants.	Multiple probe design limits demonstration of a functional relation. Coaching procedures were not specified. No generalization or maintenance data.

Table 1 (Cont)

Naturalistic Behavioral Interventions in the Preschool Classroom

Study	Design	Participants	Intervention Agent	Outcomes	Limitations
Robinson (2011)	MBL across participants	Four males with autism (3-7 years)	Teaching assistants	Increased correct use of teaching strategies with maintenance and generalization across activities and students. Improved student language with maintenance and generalization across settings.	Less than five data points taken per phase. Some overlap in data for 2 of the students. Limited generalization probes.
Schepis et al. (2001)	Non-concurrent multiple probe design across part-icipants	Five preschool children with intellectual disabilities	Para-professional	Increases in paraprofessionals use of strategies. Increases in child independent responses.	Non-concurrent multiple probe design limits demonstration of an experimental effect. No generalization or maintenance data.
Warren et al. (1984)	MBL across participants	One male and two females with language delays (2-3 years)	Teachers	Increased use of teaching strategies with generalization across settings and maintenance. Increased child verbalizations with generalization across settings and maintenance.	Generalization probes were not collected during baseline. Procedures for training teachers are not well defined.

Professional Development for Paraprofessionals

Previous reviews of the literature have examined professional development for paraprofessionals (Brock & Carter, 2013; Rispoli et al., 2011; Walker & Smith, 2015). In a previous systematic review of the literature, Rispoli and colleagues (2011) reviewed twelve studies that involved training paraprofessionals to deliver interventions to participants with ASD. The reviewed studies included training procedures such as instructional videos, written instruction, modeling, verbal instruction, supervised practice, role-play and supervisor feedback. Performance feedback was examined in nine of the studies with promising findings. Nine of the studies included a verbal or written introduction to and overview of the intervention and five of those nine studies included a rationale for using the teaching strategies. Providing a rationale for the teaching strategies may be an important component of training, since "buy-in" is suggested to increase both adoption and implementation of the intervention (Turnbull, Edmonson, Griggs, Wickham, Sailor, Reeman, & Riffel, 2002). Only three of the reviewed studies examined training paraprofessionals to implement interventions with young children in preschool settings (Hall, McClannahan, & Krantz, 1995; Hall et al., 2010; Robinson, 2011). Only two of those studies examined paraprofessionals' use of strategies to increase child social communication skills (Hall et al., 2010; Robinson, 2011). Hall et al., (2010) examined paraprofessionals' use of PRT strategies followed by a didactic workshop and then performance feedback. The results of the study suggest that paraprofessionals did not transfer or generalize skills learned during the workshop to the preschool or home environment. However, correct use of PRT strategies by paraprofessionals increased with performance feedback, suggesting that workshops alone

may not be sufficient in training paraprofessionals to use and maintain skills in the natural environment, and performance feedback may be necessary to maintain and generalize newly learned skills. Robinson (2011) assessed the impact of a training package consisting of modeling and video-based feedback on TAs' implementation of PRT in inclusive preschool settings and child social communication outcomes. The training packing resulted in increased implementation of PRT among TAs and improved social communication skills for all child participants. In addition, TAs demonstrated generalization of skills across activities.

In another systematic review of the literature, Brock and Carter (2013) investigated previous research on professional development for paraprofessionals, including which professional development strategies were associated with fidelity of implementation. They reviewed thirteen experimental studies published between 1993 and 2011. Only one of the reviewed studies examined teaching paraprofessionals to use naturalistic behavioral teaching strategies to increase social communication skills among preschool aged children (Hall et al., 2010). In this study, staff were taught to use incidental teaching to increase the spontaneous use of language in children with autism. The training package included modeling, rehearsal and feedback. Following staff training, there were increases in adults' use of incidental teaching strategies and student initiations. Overall, the results of the literature review suggest paraprofessionals are capable of implementing evidence-based practices with sufficient training. The most commonly used professional development strategies included (a) a description of the educational practice; (b) modeling of the practice by the trainer; and (c) performance feedback. The authors of the review suggest modeling and performance feedback are

associated with greater fidelity of implementation. Additionally, the authors argue that professional development workshops should extend beyond a single, one-day training and include follow-up coaching and support in the classroom context.

In another review of the literature, Walker and Smith (2015) reviewed studies in which paraprofessionals received training applicable to children with disabilities. They reviewed a total of thirty studies published between 1993 and 2012. Most of the reviewed studies (90%) included delivery of paraprofessional training through workshops, classes, and lecture-based training that involved didactic instruction. Additional classroom-based training that involved modeling, performance feedback, or action planning was used in 80% of the studies. Follow-up support following paraprofessional training was only used in 13% of the studies. Generalization of paraprofessional skills was adequately assessed across only three (10%) of studies. Twelve studies focused on providing paraprofessionals with teaching strategies for promoting social communication skills (Arthur, Butterfield, & McKinnon, 1998; Bessette & Wills, 2007; Bingham, Spooner & Browder, 2007; Causton-Theoris & Malmgren, 2005; Devlin, 2005; Hall et al., 2010; Liciardello, Harchik & Luiselli, 2008; Malmgren et al., 2005; Mazurik-Charles & Stefanou, 2010; Robinson, 2011; Schepis et al., 2003; Storey, Smith & Strain, 1993). Four studies (Hall et al., 2010; Robinson, 201; Schepis et al., 2003; Storey et al., 1993) examined training paraprofessionals to implement social communication interventions with preschool aged children. The authors coded the studies according to study quality characteristics. Hall et al., (2010) provided sufficient evidence of social validity, training fidelity, intervention fidelity and generalization, but did not provide sufficient evidence of maintenance of paraprofessional skills. Robinson

(2011) provided sufficient evidence of social validity, training fidelity, intervention fidelity, generalization and maintenance of paraprofessional skills. Schepis et al. (2003) provided sufficient evidence of intervention fidelity, but did not provide sufficient evidence of social validity, training fidelity, or generalization and maintenance of paraprofessional skills. Storey et al. (1993) provided sufficient evidence of social validity and intervention fidelity, but did not provide sufficient evidence of training fidelity or generalization and maintenance of paraprofessional skills.

No additional studies related to coaching paraprofessionals to teach social communication skills were identified, since the last literature review was published in 2015. The current literature review identified only four studies that met this criteria (Hall et al., 2010; Robinson, 2011; Schepis et al., 2003; Storey et al., 1993), indicating a scarcity of research on professional development for paraprofessionals in preschool classrooms targeting social communication interventions.

Overall, previous research supports the effectiveness of professional development packages for increasing the fidelity of implementation of evidence-based practices among paraprofessionals and improving child outcomes. There is evidence to support the use of modeling, role play, performance feedback and self-monitoring to increase paraprofessionals' use of teaching practices. Limited research has more specifically examined the effectiveness of coaching paraprofessionals to implement naturalistic behavioral interventions targeting social communication skills with preschool children. Future research should investigate the impact of coaching on paraprofessionals' fidelity of implementation of naturalistic behavioral teaching strategies, in addition to the generalization of the use of teaching strategies in the classroom context with multiple

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children with diverse social communication skills, and the maintenance of paraprofessional skills following coaching.

Conclusion

Limited research has been conducted on the effects of coaching paraprofessionals to implement naturalistic teaching strategies in inclusive preschool classrooms with positive outcomes (Hall et al., 2010; Robinson, 2011, Schepis et al., 2003; Storey et al., 1993). However, these studies have focused on having an adult implement the intervention with one child at a time. In most preschool classrooms, adults are attending to multiple children at a time with various social communication goals. Paraprofessionals need naturalistic behavioral teaching strategies that work with more than one child at a time, in order to more successfully integrate interventions into the existing structure of inclusive preschool classrooms. Therefore, this dissertation study will focus on coaching paraprofessionals to use naturalistic behavioral teaching strategies with two children at a time.

Researchers recommend that studies investigating professional development for direct staff not only include a focus on natural, inclusive environments (Schepis et al., 2000) and use of naturalistic teaching methods (Kholer et al., 2001), but should also include a measure of generalization (Reid, Parsons, Lattimore, Towery, & Reade, 2005), maintenance (Arco & Millet, 1996), fidelity of implementation (Armstrong, Ehrhardt, Cool, & Poling, 1997) and impact on focal students (Fishman, Marx, Best, & Tal, 2003; Kykriades, Creemers, & Antiniou, 2009). This dissertation study addresses all of these recommended components.

Summary

In this pilot study, TAs were coached to use naturalistic behavioral teaching strategies to promote social communication skills in a classroom with two children at a time. These are well-studied procedures that have been successfully used with a variety of adults to teach social communication skills to various populations of children. The current study aimed to add to the existing body of research that has focused on having an adult implement social communication interventions with one child at a time. Ultimately, having adults in the preschool classroom implement teaching strategies with small groups of children will be a more naturalistic approach that can be embedded within typical classroom activities and will benefit multiple children in the classroom. The following research questions were addressed:

1. Can TAs be taught to effectively implement naturalistic behavioral teaching strategies (i.e., EMT) with two children with fidelity?

2. Is there a functional relation between TAs' use of EMT and increases in child social communication skills?

3. Do TA's use of EMT generalize across children and social communication goals?

The methods for an experimental study designed to evaluate the specified research questions are described in the subsequent chapter.

CHAPTER III

METHODS

Methods for conducting a research study on coaching TAs to implement

naturalistic behavioral teaching strategies in the preschool classroom with a child dyad

(i.e., two children with DD) are described. Information about the participants, setting,

materials, measures, procedures and data analysis are summarized. All data collection

and procedural forms and materials are attached in the Appendix.

Participants

This study included four TAs from three different preschool classrooms and seven

preschool students from the same three preschool classrooms as the TAs. TAs and target

students were recruited through an early childhood education program in a small city in

the Pacific Northwest. Target students were selected by the lead teachers of participating

classrooms as needing additional support with social communication or play skills, but

having no severe challenging behavior, since competing behavioral demands may limit

the efficacy of the intervention. Additional students in the classroom, with and without

DD, rotated through the play center along with target students to assess TAs

generalization of EMT strategy use across children with varying social communication

and play skills. However, data were only collected on the participating TAs and

consented target students, and not on any additional students in the classroom.

TAs were included in the study if they were at least 18-years of age and had one

or more years of experience working in an early childhood setting. TAs had to have

some experience working with preschool-aged children and have some behavior

management skills, since competing behavioral demands are a potential threat to the

efficacy of the intervention and TAs needed to be able to use some basic behavioral

management strategies. TA participants were excluded if they did not have a permanent

position as a TA or were a long-term substitute TA in an EEP classroom. See *Table 2* for

TA demographic information.

Table 2

Teaching Assistant Demographic Information

TA	Age	Ethnicity	Years of Experience	Level of Education
Jillian	47	Pacific Islander	21	Some graduate
Erin	20	White	2	Some college
Brianne	28	White	7	Some graduate
Janice	47	White	4	Some college

Note: Years of experience indicates number of years working in an early childhood
setting.

Student participants were included if they were three to five years of age, had a

medical or educational diagnosis of a developmental disability (i.e., autism spectrum

disorder (ASD), pervasive developmental disorder not otherwise specified (PDDNOS),

speech and language delay, communication delay, etc.), and demonstrated social

communication delays as documented in their Individualized Family Service Plan (IFSP).

Student participants' social communication skills were assessed by the primary

researcher using selected domains (i.e., mands, tacts, play, social) of the Verbal Behavior

and Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008), in

addition to a parent completed MacArthur Bates Developmental Inventory (CDI; Fenson,

Pethick, Renda, Cox, Dale & Reznick, 2000). The CDI was not returned by parents of

three of the consented target students. Student participants were excluded if they were

not currently enrolled in the early childhood education program at the time of the study,

did not have an IFSP, had fewer than five spoken words, experienced severe challenging

behavior as reported by the teacher, and were not English speaking or dual-language

learners. Families were excluded from the study if they were not able to read and write in

English. See *Table 3* for child demographic data.

Table 3

Target Child Demographic Information

Child	Age	Ethnicity	Diagnosis
Alana	4	White	ASD
Orlando	5	Latino	DD/at risk ASD
Owen	3	White	DD/at risk ASD
Adam	4	White	ASD
Dylan	4	White	ASD
Leah	3	White	Speech and language delay
Esther	4	Asian	Speech and language delay

Classroom one had one TA, Jillian, and two target students, Alana and Orlando.

Jillian was 47-years old, had 21-years of experience working in an early childhood setting

and had completed some graduate school. Alana was 4-years old and had an educational

diagnosis of ASD. She had a combined score of 41.5 on four selected domains of the

VB-MAPP (i.e., mands, tacts, play, social) and 49 spoken words on the CDI as reported

by her mother. Orlando was 5-years old, a dual language learner and had an educational

diagnosis of DD with concern of a possible ASD diagnosis. He had a combined score of 43.5 on four selected domains of the V-BMAPP and 19 spoken words on the CDI as reported by his mother.

Classroom two had two TAs, Erin and Brianne. Erin was 20-years old, had two years of experience working in an early childhood setting, and had completed some college. Erin worked with two target children throughout the study, Owen and Adam. Owen was 3-years old and had an educational diagnosis of DD, with concern of a possible ASD diagnosis. He had a combined score of 12 on four selected domains of the VBMAPP and 8 spoken words on the CDI as reported by his mother. Adam was 4-years old and had an educational diagnosis of ASD. He had a combined score of 40 on four selected domains of the VB-MAPP and 24 spoken words on the CDI as reported by his mother. Brianne was 28-years old, had worked in an early childhood setting for 4-years, and had completed some college. Brianne worked with two target children during the study, Leah and Esther. Leah was 3-years old and had an educational diagnosis of speech and language delay. She had a combined score of 13.5 on four selected domains of the VB-MAPP. Leah's CDI was not returned, but her teacher reported she had at least five spoken words. Esther was 4-years old and had an educational diagnosis of speech and language delay. She had a combined score of 33 on four selected domains of the VB-MAPP. Esther's CDI was not returned, but her teacher reported she had over five spoken words.

Classroom three had one TA, Janice, and one target student, Dylan. An additional peer from the classroom played with Janice and Dylan during each session, but no data were collected on the peer. Three peers were used throughout the study (i.e., one female

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and two males), all with developmental delays. Janice was 47-years old, had seven years
of experience working in an early childhood setting and had completed some graduate
school. Dylan was 4-years old and had an educational diagnosis of ASD. He had a
combined score of 34 on selected domains of the VB-MAPP. His CDI was not returned,
but his teacher reported he had over five spoken words. See *Table 4* for a summary of
classrooms and participants.

Table 4

Summary of Classrooms and Participants

Classroom	TA	Students
Classroom 1	Jillian	Alana and Orlando
Classroom 2	Erin	Owen and Adam
	Brianne	Leah and Esther
Classroom 3	Janice	Dylan

Setting

All research was conducted in "reverse inclusion" preschool classrooms in the
pacific northwest. These programs serve a majority of children with diverse needs (e.g.,
autism, ADHD, other developmental delays) as well as a minority of children who are
developing typically. Children attend either a morning session (9:00-12:00) or afternoon
session (1:00-4:00).   Each classroom has a lead teacher, four TAs, and 10-12 children.
Lead teachers need to have at least a Bachelor's degree in a related field and are required
to get their state Early Childhood Education Authorization within a year of employment.
If teachers have a Master's degree, they are required to have their Teacher Standards and
Practices Commission (TSPC license). TAs are not required to have a degree. Daily

activities include both small and large group activities. Classrooms do not follow a specific curriculum; however, the curriculum emphasizes vocabulary, communication, self-regulation and social skills, and follows a weekly themes calendar.

Assessment procedures were conducted with individual students prior to baseline data collection during classroom observations of free play or in one-on-one 15 minute sessions with the lead researcher. These observations were made in a quiet, designated area of the classroom with a small table and child-size chairs. All baseline, coaching and intervention sessions were conducted in the preschool classroom during center-based play in previously existing, designated centers in each of the four classrooms. Each center was a well-defined play space (e.g., rug, table with child-sized chairs, cabinets) separating it from other areas of the classroom. Each of the four centers had one teaching assistant and two children at a time.

Materials

Materials already available in the classroom (e.g., blocks, cars, dollhouses, Barbie™ dolls, Marble Run™) were used, in addition to play materials supplied by the researcher. Play materials brought in by the researcher included symbolic play sets (e.g., doctor set, camping set, tea set, toy cash register with play food items), turn-taking games (e.g., Don't Break the Ice™, Pop the Pig™, Let's Go Fishin' ™) and sensory materials (e.g., Play-Doh™, water beads, sand) and were used throughout all phases of the study. Play sets were regularly rotated, since novel toys can increase motivation. Each play set included at least one symbolic play set, at least one turn taking game, and at least one sensory material. Play materials available in the classroom varied depending on the day.

Measures and Procedures

In the current study, VB-MAPP and CDI were used to gather data about student participants' social communication skills. The VB-MAPP and CDI were completed with target student participants immediately following the consenting process. The VB-MAPP was completed by the lead researcher and the CDI was completed by parents. Prior to baseline, an indirect preference assessment was conducted by asking teachers about the target students' preferred play activities and materials. See *Appendix A* for the preference assessment. Preferred activities and materials were included during sessions to improve child motivation to engage in social communication acts. Language samples were collected during two fifteen-minute baseline sessions to select goals for each target student. Fifteen-minute direct observations of teaching assistant (i.e., fidelity of implementation of EMT strategies) and student behavior (i.e., prompted, unprompted, and total target verbal requests) were conducted during baseline, coaching and intervention phases. The observation procedures, interobserver agreement (IOA) procedures, and procedural fidelity are described below. Social validity data were collected from both TAs and lead teachers at the conclusion of the study.

Verbal Behavior Assessment and Placement Program (VB-MAPP). The VB-MAPP (Sundberg, 2008) was used to characterize the sample in terms of social communication and play skills prior to intervention and guide appropriate intervention targets. The VB-MAPP is a criterion-referenced assessment, skills tracking system, and curriculum guide used to assess the language, learning and social skills of children with autism spectrum disorder (ASD) and other developmental disabilities that demonstrate

delays in language development (Sundberg, 2008). It is based on Skinner's (1957) analysis of verbal behavior, established developmental milestones, and behavior analytic research. Although the VB-MAPP has adequate re-test and content validity (Esch, Lalonde, & Esche, 2010; Gould, Nixon, Smith & Tarbox, 2011), it has not been normed with a normative sample. Although it has not been normed, it had practical use for the purposes of this study. The VB-MAPP was chosen as an assessment tool because it was specifically designed for early behavioral intervention programs and is useful for both selecting target goals for intervention and tracking skill acquisition (Sundberg, 2008; Gould, Dixon, Najdowski, Smith & Tarbox, 2011). In addition, it can be appropriately used with individuals of all ages and with various language delays (Gould et al., 2011). The VB-MAPP provides a representative sample of a child's verbal and related skills, containing measureable learning and language milestones that are sequenced and balanced across three developmental levels (level 1: 0-18 months, level 2: 18-30 months, and level 3: 30-48 months). Students at 0 -18 months should have level 1 skills, students at $18 - 30$ months should have level 2 skills, and students at $30 - 48$ months should have level 3 skills. Therefore, if a child is 38 months and demonstrates level 1 or 2 skills in a specific domain, for example, they are likely delayed in that domain. Items are not only operationally defined, but they also consider the function of verbal behavior and include questions that assess the relevant conditions in which the child uses language (Gould et al., 2011). For the purposes of this study, the following domains of the VB-MAPP were used: mands, tacts, play, and social (Sundberg, 2008), as these were directly target through EMT.

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The lead researcher completed the VB-MAPP with each target student during 30-minute observations at free-play in the preschool classroom, in addition to two individual 15-minute assessment sessions with each target child. Each individual assessment session took place in the corner of the preschool classroom at a child-sized table with child-sized chairs. The researcher discussed any items from the VB-MAPP that were not observed during observation and assessment sessions. See *Appendix B* for the VB-MAPP assessment. See *Table 5* for information on VB-MAPP scores.

MacArthur Bates Developmental Inventory (CDI) Short Form. The CDI-short form (Fenson et al., 2000) was used to confirm social communication difficulties among student participants and describe social communication skills immediately prior to intervention. The CDI is a standardized, parent report instrument that provides a systematic way for researchers and professionals to use parents as informants regarding their child's language abilities (Fenson et al., 2000) and can be found in *Appendix C*. The CDI is appropriate for children ages 8-37 months, as well as older children with developmental delays (Fenson, et al., 2000). It describes children's developing abilities in several domains of early language, including vocabulary comprehension and production, gesture use and early grammar. The CDI: Words and Sentences (Toddler Form B) was used, as it is appropriate for 16- to 30-month old children, and can also be used with older children with DD (Fenson et al., 2011). It contains a 100-word productive vocabulary checklist and a question about combining words. The CDI: Words and Sentences has strong psychometric evidence (Fenson et al., 2000). The CDI was sent home with consent forms for parents to complete and was returned for three target students. See *Table 5* for information on child CDI scores.

Table 5

Target Student Performance on CDI and VB-MAPP

Student	CDI	Mands score (level)	Tacts score (level)	Play score (level)	Social score (level)
Alana	49	11 (3)	13 (3)	10 (2)	5.5 (2)
Orlando	19	11 (3)	12.5 (3)	11 (3)	8 (2)
Owen	8	2 (1)	1 (1)	6 (2)	4 (1)
Adam	24	9.5 (2)	12.5 (3)	12 (3)	6 (2)
Dylan	NA	7 (2)	8 (2)	12 (3)	7 (2)
Leah	NA	4 (1)	1 (1)	4.5 (1)	4 (1)
Esther	NA	5 (1)	6 (2)	12 (3)	10 (2)

Language samples. Two language samples were collected for each target child during baseline to assess mean length of utterance of child unprompted verbal requests. The mean length of unprompted verbal requests was calculated for each target student by adding the number of words in each unprompted verbal request and dividing by the total number of unprompted verbal requests. Verbal requests were considered unprompted if they occurred within more than *5s* of an adult verbal prompt. These data were used to select target length of verbal requests for each child. Please see *Table 6* for information on child mean length and target length of verbal requests.

Table 6

Target Student Mean Length of Unprompted Verbal Requests and Target Length of Unprompted Verbal Requests in Baseline

Target student	Mean length of unprompted verbal requests	Target length of unprompted verbal requests
Alana	4.63	6
Orlando	2.83	4
Owen	.33	1
Adam	3.68	5
Dylan	2.70	4
Leah	.08	1
Esther	1.80	3

Note: Mean length of unprompted verbal requests was calculated from two language samples collected during two 15-minute play sessions during baseline.

Direct observations. Each session was video recorded using a video camera (located on a nearby shelf approximately two feet away). TAs wore a Sony ECM AW4™ blue-tooth wireless microphone connected to the video camera to get better audio from target students. *In-vivo* or video observations of 15-minute play interactions between participating TAs and two students during center-based play were conducted by the lead researcher and four trained doctoral level student observers for coding. Due to length of transitions and other factors (e.g., delayed bus schedule), some sessions were less than than 15 minutes (i.e., 28 sessions). Only sessions that were at least 12-minutes were coded for TA and student data.

Inter-observer agreement. IOA was collected by four trained graduate student observers. Graduate student observers participated in a two-hour training on data collection through didactic instruction, examples and non-examples of the behavior, talk-through sessions and practice sessions. Practice sessions involved providing video examples and having observers practice using the data collection forms. If IOA dropped

below 80%, graduate student observers met individually with the researcher to review behavioral definitions and participate in more video practice.

Inter-observer agreement (IOA) was collected on a minimum of 20% of all 15-minute observation periods for TA (i.e., fidelity of implementation), target student (i.e., prompted verbal requests, unprompted verbal requests, total verbal requests) and coaching behavior (i.e., procedural fidelity). According to What Works Clearinghouse (WWC) single case design standards, IOA must be collected on a minimum of 20% of all observations and must be collected across all phases of a study (Kratchowill, Hitchcock, Horner, Levin, Odom, Rindskopf, & Shadish, 2010). This study is designed to exceed the minimum IOA observations required by WWC. Percentage of inter-observer agreement was calculated using the block by block method. Agreement was calculated for each block (i.e., observation interval) and the sum of the block-by-block coefficients was calculated and divided by the number of intervals and then multiplied by 100 to determine inter-observer agreement. For TA behavior, IOA was collected for 26% of baseline sessions, 36.5% of coaching sessions, and 33.36% of maintenance sessions. Overall IOA for TA fidelity of implementation was 92.67% and ranged from 85.6% to 100%. IOA on target student behavior was collected across 36.05% of baseline sessions, 25.98% of coaching sessions, and 20% of maintenance sessions. IOA for target student behavior was 89.32% and ranged from 75% to 100%.

IOA was also calculated for language samples used to assess target student MLU. Interobserver agreement was calculated by comparing the MLU calculated by each observer. The smaller observed MLU was divided the larger observed MLU and

multiplied by 100. IOA was collected for 20.83% of language samples. IOA was 93.83% with a range of 84% - 99.20%.

Teaching assistant behavior. The primary dependent variable of interest was fidelity of implementation of naturalistic behavioral teaching strategies by TAs. Treatment fidelity was measured using an event recording system, recording each time the TA correctly performed a procedure per session. Treatment fidelity measures assessed TAs' use of the following procedures: (a) follow the students' lead, (b) notice and respond to students' communication attempts, (c) mirror and map, (d) model and expand language and play, (e) environmental arrangement, and (f) least-to-most prompting. The TA received a score of 0-1 or not applicable (NA) for each of the items being measured out of a total of 14 possible items. A score of 1 (i.e., Yes) indicated correct use of the strategy, whereas a score of 0 (i.e., No) indicated incorrect use or absence of the strategy.   See *Table 7* for measured items. See *Appendix D* for TA Treatment Fidelity data collection forms. The percentage score of intervention steps implemented correctly by the TA was calculated by adding the total number of points earned and dividing by the total number of items and multiplying by 100. Scores marked as NA were not included in the overall score.

Table 7

Enhanced Milieu Teaching Strategies

Enhanced Milieu Teaching Strategies
Follow Students' Lead
Actively engages with same activities/or materials as students (at least one student at a time if engaged with different activities/materials).
Stays at students' eye level and face to face 90% of the time.
Gives less than three play related directions per session per student (e.g., let's play with the barn) and asks less than three wh-questions per session per student (e.g., who, what, where, why) except for providing a choice or asking "what do you want?" Behavioral directions (e.g., "Keep the water beads in the bucket") are don't count as play related directions.
Notice and Respond
Notices and responds to students' communication attempts at least 75% of the time for both students within three seconds.
Verbally prompts child initiations and or responses to peers (e.g., you can tell Annie, "I want a turn.")
Facilitates turn taking between peers during play using verbal prompts (e.g., "Now it is Joey's turn to use the shovel") or visual prompts (e.g., timer).
Mirror and Map
Imitates students' words within 3 seconds of vocalization *at least three times per student*.
Imitates students' play actions within 3 seconds of action at least 3 times per student.
Labels students' actions *at least 3 times per student*.
Model and Expand
Expands on students' communication attempts by adding words within 3 seconds of child communication *at least 3 times per student*. Communication attempts may include gestures.
Models a new symbolic play action with a toy *at least 3 times per student*. This can be directed towards both student at same time.

Table 7 (Contd)
Enhanced Milieu Teaching Strategies
Environmental Arrangement

Uses at least 2 of the following with both students (i.e., 2 strategies per student):
      -In sight but out of reach
      -Pausing within routine
      -Inadequate Portions
      -Sabotage
      -Use of peer to withhold items
 Strategies may be used with an individual child at a time or directed toward both children at the same time.

Least-to-Most Prompting

TA uses least to most prompting hierarchy correctly.
   1. Gains child's attention
   2. 3 second time delay
   3. Provides choice
   4. Provides say prompt
   5. Provides object/action using target words or expanding on students' words

Provides desired item/activity for correct responding *within 3 seconds.*

Target student behavior. Frequency data on target student social

communication skills, including *prompted target verbal requests*, *unprompted target*

verbal requests, and *total target verbal requests* were collected for each target during

each 15-minute play observation.   Observers tallied each occurrence of student behavior

during the 15-minute observation period and calculated the total occurrence of each target

behavior. See *Appendix* E for data collection forms for target student behavior. See

Table 8 for definitions of prompted target verbal requests and unprompted target verbal

requests. Total target verbal requests were calculated by adding prompted target verbal

requests and unprompted target verbal requests for each session.

Table 8

Behavioral Definitions for Target Student Behavior

Behavior	Definitions	Example	Nonexample
Prompted target verbal request	Any verbal request for an object or action that meets the target student's individual target length of words or above and that occurs *within 5 seconds* of an adult verbal prompt. If the student vocalizes above acceptable level (i.e., can be heard 30 feet or more across the classroom) or exhibits physical aggression (e.g., pushing adult or peer away, throwing object) this will be considered challenging behavior and not a verbal request.	Student's target length of words is 3 words. Adult says "Say, I want fish" and student says, "I want fish" within *5 seconds* of the adult.	Student's target length of words is 3 words. Adult says "Say, I want Barbie" and student says, "Barbie please" *within 5 seconds* of the adult.
Unprompted target verbal request	Any verbal request for an object or action that meets the target student's individual target length of words or above and that occurs without an adult verbal prompt or *within more than 5 seconds* of an adult verbal prompt. If the student vocalizes above acceptable level (i.e., can be heard 30 feet or more across the classroom) or exhibits physical aggression (e.g., pushing adult or peer away, throwing object) this will be considered challenging behavior and not a verbal request.	Student's target length of words is 4 words. Adult holds up Barbie. Student says, "I want to play Barbie"	Student's target length of words is three words. Adult holds up car and asks "What do you want?" and student says "car".

Data on target students' mean length of utterances (MLU) were collected at four randomly selected points in time during both baseline (i.e., 2 sessions) and follow-up phases (i.e., two sessions). Three independent doctoral student observers used recorded videos of 15-minute play interactions to complete language samples for target student participants. Language samples were not conducted for Dylan because his peers did not have video consent. Data collectors recorded all observed word approximations/words/or phrases and recorded each utterance word for word for each 15-minute video observation.

Language samples were used to calculate MLU. The lead researcher added the number

of words for each individual child utterance, with approximations equal to zero. MLU

was then calculated for each student sample.

Procedural fidelity. Procedural fidelity data on the primary researcher's use of

training and coaching procedures were collected for 85% of coaching sessions to ensure

correct implementation of procedures. Coaching will be described later in this section.

See *Appendix F* for procedural fidelity measures. IOA for procedural fidelity was

collected across 20% of sessions and was calculated at 100%. Procedural fidelity was

93.81% and ranged from 85.7% to 100%.

Social validity questionnaires. Subjective evaluation data on the social

significance, acceptability and importance of intervention goals and outcomes, as well as

the feasibility and acceptability of intervention procedures were collected. Subjective

evaluations were conducted with both participating TAs (i.e., four teaching assistants)

and their corresponding lead classroom teachers (i.e., three lead teachers) by the primary

investigator. Data from one of the lead teachers are missing because she went on

maternity leave during the study. Social Validity data were collected at the conclusion of

the study. Adapted versions of the Treatment Acceptability Rating Form (TARF-R;

Reimers, Wacker & Cooper, 1991) were developed for this study. The TARF-R is a 5-

point Likert scale with 17 items yielding a composite score. Items were organized into

composite reflecting several acceptability dimensions, including reasonableness,

effectiveness, side effects, disruptive/time, cost and willingness. The internal consistency

of the TARF-R has been measured (Reimers, Wacker, Cooper, & DeRaad, 1992) with an

overall coefficient of .92 and the following mean α coefficients: (a) reasonableness = .90;

(b) effectiveness = .95; (c) side effects = .77; (d) disruptiveness = .69; (e) cost = .71; and

(f) willingness (Reimers, Wacker, Cooper, & DeRaad, 1992). Questions from the

adapted version of the TARF-R focused on how useful the TAs and lead teachers found

the intervention, whether or not they believed the intervention contributed to improved

child outcomes, how easy it was to deliver the intervention, how well the intervention fit

in with the classroom's daily routine, and how likely they were to continue to using

intervention strategies in the classroom. Social validity data were analyzed by calculating

mean and range response scores. See *Appendices G-H* for social validity measures; *Table

9* for TA responses on the social validity questionnaire; and *Table 10* for lead teacher

responses on the social validity questionnaire.

Table 9

Social Validity Responses from Teaching Assistants

Item	Scale	Mean score	Range
How acceptable did you find the naturalistic behavioral intervention?	1 = Not at all acceptable 3 = Neutral 5 = Very Acceptable	4.5	4 – 5
How willing are you to have your TA carry out the naturalistic behavioral teaching strategies?	1 = Not at all willing 3 = Neutral 5 = Very willing	5	5

Table 9 (Contd)

Social Validity Responses from Teaching Assistants

Item	Score	Mean scale	Range
How much time was needed each day for our TA to carry out the naturalistic behavioral teaching strategies?	1 = Little time was needed 2 = Neutral 3 = Much time was needed	2.67	2 – 3
How confident are you that the naturalistic behavioral intervention is effective for children in your classroom?	1 = Not at all confident 3 = neutral 5 = Very confident	4.5	3 – 5
How likely is it that using the naturalistic behavioral teaching strategies will make permanent improvements in the social communication skills of children in your classroom?	1 = unlikely 3 = neutral 5 = very likely	4.75	4 – 5
How disruptive was it to carry out the naturalistic behavioral intervention in the classroom?	1 = not at all disruptive 3 = neutral 5 = very disruptive	3.25	2 – 4
How much did you like the procedures used in the intervention?	1 = do not like them at all 3 = neutral 5 = like them very much	4.25	3 – 5
To what extent did you notice undesirable side-effects from the intervention?	1 = no side effects 3 = neutral 5 = many side effects	2	1 – 3

Table 9 (Contd)

Social Validity Responses from Teaching Assistants

Item	Score	Mean Scale	Range
How willing are you to change your routines to continue to carry out this intervention in the classroom?	1 = not at all 3 = neutral 5 = very willing	4.75	4 – 5
How well did carrying out the intervention fit in with your existing classroom routine?	1 = not at all well 2 = neutral 5 = very well	4.5	4 – 5
How well did the goal of intervention fit in with your professional goals?	1 = not at all 3 = neutral 5 = very much	4.25	3 – 5
Did you learn valuable strategies from participating?	1 = not at all valuable 3 = neutral 5 = very valuable	4.25	3 – 5

Table 10

Social Validity Responses from Lead Teachers

Item	Scale	Mean score	Range
How acceptable did you find the naturalistic behavioral intervention?	1 = Not at all acceptable 3 = Neutral 5 = Very Acceptable	4.75	4 – 5
How willing are you to carry out the naturalistic behavioral teaching strategies?	1 = Not at all willing 3 = Neutral 5 = Very willing	4.75	4 – 5
How much time was needed each day for you to carry out the naturalistic behavioral teaching strategies?	1 = Little time was needed 2 = Neutral 3 = Much time was needed	3	3 – 3

Table 10 (Contd.)

Social Validity Responses from Lead Teachers

Item	Scale	Mean score	Range
How confident are you that the naturalistic behavioral intervention is effective for children in your classroom?	1 = Not at all confident 3 = neutral 5 = Very confident	4.5	4 – 5
How likely is it that using the naturalistic behavioral teaching strategies will make permanent improvements in the social communication skills of children in your classroom?	1 = unlikely 3 = neutral 5 = very likely	4.5	4 – 5
How disruptive was it for your TA to carry out the naturalistic behavioral intervention in the classroom?	1 = not at all disruptive 3 = neutral 5 = very disruptive	2	1 – 3
To what extent did you notice undesirable side-effects from the intervention?	1 = no side effects 3 = neutral; 5 = many side effects	2	1 – 3
How much discomfort did children in your classroom experience during the intervention?	1 = no discomfort at all 3 = neutral 5 = very much	3	3 – 3
How willing are you to change your routines to continue to carry out this intervention in the classroom?	1 = not at all 3 = neutral 5 = very willing	4.75	3 – 5

Table 10 (Contd.)

Social Validity Responses from Lead Teachers

Item	Scale	Mean score	Range
How well did carrying out the intervention fit in with your existing classroom routine?	1 = not at all well 2 = neutral 5 = very well	4	3 – 5
How well did the goal of intervention fit in with your classroom goals?	1 = not at all 3 = neutral 5 = very much	5	5 - 5
Did TAs learn valuable strategies from participating in this intervention that you were not already using?	1 = not at all valuable 3 = neutral 5 = very valuable	4.5	4 – 5

Research design

A single-case, randomized multiple baseline design across four triads (Cooper, Heron & Heward, 2007; Gast, Lloyd, & Ledford, 2014; Kennedy, 2005; Koehler & Levin, 1998) was used to evaluate the effectiveness of coaching TAs to implement naturalistic behavioral teaching strategies on TA's fidelity of implementation of naturalistic behavioral teaching strategies and subsequent student social communication skills. Single-case research design is a rigorous, quantitative scientific methodology that can determine whether a functional relation exists between the introduction of a researcher-manipulated independent variable and changes in a dependent variable (Horner, Carr, Halle, McGee, Odom & Wolery, 2005; Kratchowill et al., 2010). A multiple baseline design was chosen because the dependent variables are learned behaviors that are inappropriate for a reversal design, in which behaviors are expected to

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return to baseline levels once the independent variables have been removed. This design also allows for at least four demonstrations of effect and controls for threats to internal validity (i.e., history and maturation) through the staggering of experimental phases across participants (Gast et al., 2014).

Each triad included a TA and two students with DD from corresponding preschool classrooms. The ultimate goal was for TAs to use naturalistic behavioral teaching strategies with small groups of children, to more naturally fit in with existing classroom activities. Additional student dyads, including students with and without DD from the classroom rotated through the play-based centers throughout the study, in order to assess TA's generalization of targeted naturalistic behavioral teaching strategies. Generalization data were taken during both baseline and coaching/maintenance phases. However, data were only collected on TAs' use of strategies and not students' social communication skills during generalization sessions.

A dual regulation randomization procedure was used for this research study (Koehler & Levin, 1998). First, TAs were randomly assigned a position within the multiple baseline design. Then, TAs were randomly assigned a start point of the coaching phase. The use of randomization in single-case design can increase the internal validity of the study by decreasing the probability of a Type I error, allowing for greater statistical inferences, including the calculation of a standardized effect size (Ferron & Ware, 1995; Kratchowill & Levin, 2010). In this study, each of the four TA participants were randomly assigned to a position within the multiple baselines, where coaching start dates were staggered over time (Kratchowill & Levin, 2010). The lengths of the baselines were randomly assigned within a researcher selected range of possible

intervention start dates, using a randomized start point design (Kratchowill & Levin, 2010). Ranges of potential start dates were chosen to ensure that the baselines were appropriately staggered according to single-case research design logic (Kratchowill & Levin, 2010). A random number generator was used through Microsoft Excel to randomize TA's position within the multiple baseline design and coaching start points for each TA. First, the researcher made a column with the list of TA's names. A new column was made using the randomization function, which generated a random number between 0 and 1 for each TA. Those values were copied to a new column to obtain actual values. The list was then sorted, using the sort function, by smallest to greatest. The newly generated list was used to order the multiple baselines. The same procedure was used with potential start points for each TA participant. The range of possible coaching start points for the first TA participant, Jillian, was between five to seven baseline data points. The randomly selected start point for Jillian was after five baseline data points. For each subsequent TA participant, three possible start dates were selected with no overlapping potential start dates, in an effort to stagger the beginning of coaching for each participant in a time lagged fashion, which is inherent to the multiple baseline design. For the second TA participant, Erin, the range of possible coaching start points was eight to ten. The randomly selected start point for Erin was after eight data points. For the third TA participant, Janice, the range of possible coaching start points was eleven to thirteen. The randomly selected start point for Janice was after twelve data points. For the final TA participant, Brianne, the range of coaching intervention start points was between fourteen to sixteen. The randomly selected start point for Brianne was after sixteen data points. See *Figure 1* for a description of the timeline for triad.

Figure 1

Timeline for Randomized Multiple Baseline Design

Participants	Baseline	Coaching/Maintenance
Jillian and Alana/Orlando	5 days	8 weeks
Erin and Owen/Adam	8 days	6 weeks
Janice and Dylan	12 days	4 weeks
Brianne and Leah/Esther	16 days	3 weeks

During coaching and maintenance phases, TAs participated in three to four 15-minute sessions per week. More information is provided on both coaching and maintenance sessions later in this chapter. Coaching and maintenance phases occurred across three to eight weeks. Jillian received a total of eleven coaching sessions; Erin received a total of thirteen coaching sessions; Janice received a total of six coaching sessions; and Brianne received a total of four coaching sessions. Data were collected on six maintenance sessions for Jillian and four maintenance sessions for Brianne. See *Figure 2* for a description of study procedures.

Figure 2

Study Procedures

Pre-baseline	Baseline	Training	Coaching/ Maintenance	Post-Intervention
CDI VB-MAPP	2 language samples TA fidelity of Implementation Target student prompted, unprompted, target verbal requests	No data collected	2 language samples TA fidelity of Implementation Target student prompted, unprompted, target verbal requests Procedural fidelity	Social Validity questionnaires (TAs and lead teachers)

Baseline. Baseline sessions occurred three to four days per week. During

baseline, each TA engaged in 15-minute play interactions with a student dyad in a

designated play center in the preschool classroom. Each TA was instructed to play with

the student dyad while the coach observed, but was given no directions or feedback from

the coach. The coach would occasionally help to lead a target student back to the

designated play area and engage them in a play activity as needed.

Intervention. Evidence-based, naturalistic behavioral teaching strategies

targeting child social communication skills, specifically EMT, were evaluated in this

study (e.g., Hancock & Kaiser, 2000; Hemmeter & Kaiser, 1994; Kaiser, Hancock &

Nietfield, 2000; McCathren, 2000; Kaiser & Trent, 2007; Olive et al., 2007). EMT was

implemented with one student dyad at a time by TAs in the preschool classroom during

center-based play. The primary researcher trained and coached TAs to implement EMT.

The primary researcher is a doctoral student, trained by an EMT researcher, with five

years implementing EMT. More detailed information about training and coaching will be provided in this chapter. TAs learned the following strategies:

1. Follow the students' lead

2. Notice and respond to students' communication

3. Mirror and Map: Imitate the students' actions and accompany them with words

4. Model and expand new language

5. Environmental arrangement

6. Least-to-Most Prompting

7. Reinforcement of social communication

Follow the students' lead. TAs were trained and coached to follow the students' lead by staying at their eye level and face to face, doing what the student is doing and letting the student lead the play, engaging with the same toys, activities and materials as the student, and avoiding play directions and asking too many wh-questions (e.g., who/what/where questions, questions that test child's knowledge but are not related to play). TAs were also given information on choosing toys and activities that are developmentally appropriate, interesting and engaging to students, as well as promote social interaction.

Notice and respond. TAs were trained and coached to notice and respond to students' communication by recognizing how and why the students are communicating and at what level students are communicating, in addition to responding every time a student communicates. TAs were taught that all children communicate in different ways, both verbally and nonverbally, and to recognize students' current communication levels.

See *Table 11* for an example of communication level guidelines taught to TAs. See

Table 12 for an example of responses to student communication acts taught to TAs.

Table 11

Types of Child Communication

Prelinguistic	Linguistic
Point	Signs
Show	Pictures
Give	Symbols
Vocalization	Words
Head shake	Phrases

Table 12

Example Responses to Student Communication Acts

Communication act	Response
Student tries to grab truck from you.	I want truck
Student grabs your hand to help you reach a ball up on the shelf.	Help
Student points to a butterfly poster on the wall.	Look at the butterfly
Student hands you a container of toys she can't open.	Open

Mirror and map. TAs were trained and coached to mirror and map the students'

actions by first imitating ("mirroring") what the student was doing and then labeling

("mapping") the student's actions with words. TAs were taught to balance mirroring and

mapping with play.

Model and expand. TAs were trained and coached to model and expand

language by imitating the student's communication acts and adding words, according to

each target student's communication level. See *Table 13* for communication guidelines

given to TAs. TAs were trained and coached to model and expand play by modeling

different symbolic play actions or adding new objects to play. See *Table 14* for a

definition of symbolic play given to TAs. TAs were taught to set new objects in sight and

wait to see if the student was interested. If the student was interested, the TA was taught

to model new play actions with the object. If students were not interested, TAs were

instructed to try again later by introducing new objects and modeling different actions.

Table 13

Communication Targets by Student Level

Communication level	Target	Example
Vocalizations, no gestures	Single Words	"baby"
Vocalizations, no gestures	Single Words	"baby"
Gestures, vocalizations, some single words	Single Words	"baby"
50+ single words, including verbs	Two Words	"feed baby"
2 - 4 word utterances	3 – 5 words	"feed baby food"
5+ word utterances	6+ words (focus on adjectives and adverbs)	"I'm feeding the baby green food"

Table 14

Definition of Symbolic Play

Definition	Example
Any instance of: • Using one object as if it were another object • Attributing properties to an object it does not have • Referring to absent objects as if they are present	• Pretending a toy banana is a phone • Pretending toy food is hot or cold • Pretending to fly a plane without the object present

Environmental arrangement. TAs were trained and coached to use

environmental arrangement teaching strategies to initiate communication temptations

among target students. See *Table 15* for environmental arrangement strategies taught to

TAs.

Table 15

Environmental Arrangement Teaching Strategies

Strategy	Description	Example
Inadequate portions	When playing a game, or engaging in activity that requires multiple parts or materials, only give the student a small portion of the parts or materials at a time or don't give them a required material to complete activity, so the student will need to request more parts or materials.	Example, when the playing Jumping Jack™ game, only give the child a few carrots at a time so that they will be motivated to ask for "more carrots".
In sight but out of reach	Put the student's favorite toys, games or materials in sight but out of reach. This way the student needs to use their words to request the preferred item.	If you know the child's favorite game is the Jumping Jack™ game, put it up on the shelf where they can see it but can't reach it without your help.
Assistance	Create situations in which you know the student will need your help (e.g., assembling parts of a toy). The student will need to use their words to ask for your help.	Give the child a container of playdough without opening it for them so they will be motivated to ask for "help".
Sabotage	Do something that the student does not want you to do (but don't be mean!). They will have to use their words to request you engage in a different behavior.	Turn off Go Fishin' ™ game and hold your hand over it so the child will be motivated to ask you to "turn on."
Choice making	Give the child choices between activities and materials, giving them an opportunity to use their words to tell you what they want.	Hold up a blue dinosaur and an orange dinosaur and let them choose which one they want to play with.
Pausing within a routine	After a student is engaged in a play routine with you, pause before continuing with a desired action and cue student to use words by looking at them expectantly.	Before rolling car down track pause and wait for the student to say "Go car"

Least-to-most prompting. TAs were taught to follow through with communication temptations through the use of prompts. More specifically, TAs were trained and coached to implement a least-to-most prompting procedure, in which the least supportive prompts were followed by more supportive prompts as necessary. Least-to-most prompting was used after TAs had set up an opportunity for the student to communicate using an environmental arrangement teaching strategy or when it was clear the student was making a request. After gaining the child's attention, TAs were taught to use the following in succession: (1) time delay; (2) choice; (3) time delay; (4) "say prompt". They were taught to follow through with successful student communication with reinforcement (i.e., access to activity or object) and expansion of the student's communication. If students were having difficulty using their words despite a prompt using least-to-most prompting, the TA was taught to use most-to-least prompting. This procedure was used with Owen. The TA was taught to begin prompting with a model procedure (i.e., "say prompt") with Owen. The TA was instructed to provide at least two "say prompts" as necessary before delivering reinforcement. See *Figure 3* for a flow chart of least-to-most prompting strategies taught to TAs.

Figure 3

Least-to-Most Prompting Strategies
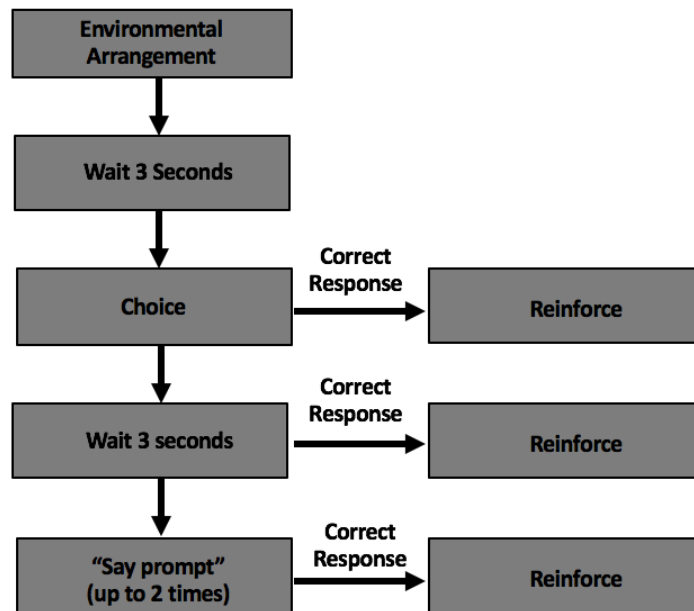
EMT with a child dyad. In addition to being trained and coached in the use of naturalistic behavioral teaching strategies, TAs were coached in strategies for implementing intervention with two students at a time. These strategies included: integrating students' interests or facilitating turn taking, noticing and responding to both students' communication attempts, balancing communication turns between students, labeling peers' actions, modeling and expanding at each students' level and using peers for environmental arrangement (e.g., have peer hold materials).

Training. TAs participated in a two-hour training session with the primary researcher on the use of naturalistic behavioral teaching strategies, specifically EMT. TAs were trained using instructional strategies that have previously been used to train paraprofessionals (Rispoli, Neely, Lang & Ganz, 2011), including written instructions, instructional video models and role play. A PowerPoint presentation was used that

included an overview and task analysis of each strategy, examples and non-examples, video models of an adult implementing each strategy with a student dyad, and four comprehension questions regarding each strategy. Each TA was also shown video clips of themselves using specific strategies correctly during baseline. For example, TAs were shown videos of themselves expanding student language. TAs were then led through role-play on the use of least-to-most prompting strategies and taught how to use an activity matrix for embedding intervention into daily play activities using classroom toys and materials. Each TA was given a binder with all printed powerpoint slides, a task analysis of each strategy and blank activity matrices. Please see *Appendix J* for task analysis and *Appendix K* for the activity matrix. See *Table 16* for an example filled-out Activity Matrix.

Table 16

Example Activity Matrix

Toys/Activities	Target Words/Phrases	Strategies
Ball maze	ball roll	Inadequate portions (only give one ball and hold bag of balls) Time delay (hold ball and look expectantly and wait) Mirror and map (roll ball)
Bunny game	carrot hop	Inadequate portions (only give one carrot and hold bag of carrots) Time delay (hold ball and look expectantly and wait) Mirror and map (hop)

Table 16 (Contd)

Example Activity Matrix

Toys/Activities	Target Words/Phrases	Strategies
Jumping Jack™	burger eat	Inadequate portions (only give one ball and hold bag of balls) Time delay (hold ball and look expectantly and wait) Mirror and map (eat)
Water beads with ocean animals	shark whale crab swim	Choices (e.g., shark or whale) Mirror and map (e.g., "shark swim")
Play-Doh ™	green blue red yellow roll pat	Choices (e.g., green or blue) Mirror and map (roll, pat)

Coaching. Immediately following training, TAs were coached by the lead researcher in the designated play center in the classroom during 15-minute play interactions with student dyads using direct feedback. TAs were coached similarly to how previous studies have coached paraprofessionals (Rispoli, Neely, Lang & Ganz, 2011), including practice and immediate verbal feedback from the coach. At the beginning of each session, the coach reviewed the task analysis with the TA. Then the coach gave the TA 15-minutes to practice use EMT strategies with the student dyad with direct feedback from the coach. The coach: (1) Pointed out an opportunity to use a strategy (e.g., "How can you use environmental arrangement to create a communication temptation with the marble run game?"); (2) Waited for the TA to use the correctly strategy; (3) Provided

error correction (i.e., verbal description of how to appropriately use strategy) as

necessary; (4) Modeled use of the strategy with the children if the TA was unable to use

strategy correctly after three opportunities and; (5) Provided descriptive social praise for

correct use of strategy (e.g., "Great job labeling his actions using words at his target

level"). At the conclusion of the session, the coach provided verbal feedback (i.e., review

of what worked well and what to work on in the next session) and gave the TA an

opportunity to ask any questions. See *Table 17* for coaching procedures. After TAs

reached 90% fidelity across two consecutive coaching sessions, maintenance sessions

began. Only Janice and Brianne participated in maintenance sessions.

Table 17

Coaching Procedures

Coaching procedures
Coach reviews task analysis with TA.
Coach gives TA 15-minutes to practice using strategies with child dyad.
Coach points out opportunities to use strategies.
Coach waits for the TA to use the strategy correctly.
If the TA does not use the strategy correctly, the coach provides verbal error correction.
If the TA is unable to correctly use the strategy after 3 opportunities, the coach models correct use of the strategy.
Coach provides the TA with descriptive verbal praise at least 8 times per session.
Coach provides verbal feedback at the end of the 15-minute session.
Coach gives the TA an opportunity to ask any questions.

Maintenance. During maintenance sessions, TAs continued to be observed during 15-min play sessions with a student dyad. Maintenance sessions occurred in the same designated play center in the preschool classroom as baseline and coaching sessions. During maintenance sessions, no feedback was given by the coach. Janice participated in six maintenance sessions and Brianne participated in four maintenance sessions. If fidelity of implementation dropped below 80% after two consecutive sessions, TAs received further coaching. Janice received further coaching from the lead researcher after two maintenance sessions. This included a 40-minute session with the coach, involving a review of strategies the she was not consistently using accurately (i.e., noticing and responding, mirroring and mapping, modeling and expanding language) and video feedback. Video feedback involved watching a 15-minute maintenance session with the lead researcher and discussing opportunities to use noticing and responding, mirroring and mapping, and modeling and expanding with each target student.

Generalization probes. Generalization probes occurred during baseline, coaching and maintenance. During generalization probes, all procedures remained the same according to the phase (i.e., baseline, coaching, maintenance). The only difference was that TAs were observed during 15-minute play sessions with other peers in the classroom, with and without DD, instead of target students. TAs worked with three to four different children in the classroom with a wide range of social communication skills during generalization sessions. Janice participated in three generalization sessions in baseline, which included a target participant (i.e., Alana) and a peer from the classroom, and two generalization sessions during maintenance, which included two different students from the classroom. Erin participated in two generalization sessions during

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baseline and one generalization session during coaching. Janice participated in one

generalization session during baseline and one generalization session during coaching.

Brianne participated in two generalization sessions during baseline and two

generalization sessions during coaching.

Data analysis

Data were analyzed using visual analysis of graphed data of the dependent

variables. Visual analysis is widely accepted as an effective data analysis tool in single

case research (Kennedy, 2005; Park, Maraschilo, & Gaylord-Ross, 1990).   Data were

analyzed based on well-accepted guidelines for visual analysis of graphed line data

including level, trend, variability, immediacy effect and overlap (Gast, 2010). Data were

graphed and analyzed for both participating TAs and students and graphed following

each session to evaluate trends, levels, overlap and variability in the data during each

phase of the study. Data were collected and graphed for the following dependent

variables for each 15-minute session: percentage of steps completed independently and

correctly by the TA, frequency of prompted target verbal requests elicited by each target

student, frequency of unprompted target verbal requests elicited by each target student,

and frequency of total target verbal requests elicited by each target student.

Additionally, non-overlap indices (i.e., Tau-U) and follow-up effect sizes (i.e.,

Hedges *g*) were calculated to provide a summary representation of study results. Tau-u is

a non-overlap method. Unlike other non-overlap methods, Tau-U is not affected by a

ceiling effect and performs well in the presence of trend in baseline (Tarlow, 2016). Tau-

u was calculated using the Tau-U calculator for single-case research

(http://www.singlecaseresearch.org/calculators/tau-u). A standardized effect size

comparable to Cohen's d (i.e., Hedges g) was also calculated. Hedges g is a between-case effect size, examining how much observations differ over cases within the same group. It is especially useful for multiple baseline designs because it includes vertical analysis of the data and is also able to account for autocorrelation and small sample size bias (Hedges, Pustejovsky, & Shadish, 2012). Hedges g was calculated using d_{hps} SPSS macro for single case designs.

The obtained effect sizes were compared to Cohen's d guidelines (1988) to determine the magnitude of the effect. According to Cohen's d guidelines, $d = 0.20$ indicates a small effect, $g = 0.50$ indicates a medium effect, and $g = .80$ indicates a large effect. Visual analysis, effect sizes, and Tau-U were used to determine if there exists (1) A functional relation between coaching and TAs increased use of EMT strategies, in addition to the magnitude of the effect; and (2) A functional relation between TAs use of EMT strategies and increased social communication skills among target student participants, in addition to the magnitude of the effect.

Summary

This chapter describes the methods for a single-case, multiple baseline design across participants. These methods allow for an experimental evaluation of the following research questions: (1) Can teaching assistants be taught to effectively implement naturalistic behavioral teaching strategies (i.e., EMT) with a student dyad with fidelity?; (2) Is there a functional relation between teaching assistants' use of EMT and increases in child social communication skills?; and (3) Does teaching assistants' use of EMT generalize across children and social communication goals? Results of the research study are described in the subsequent chapter.

CHAPTER IV

RESULTS

A description of study results is summarized, focused on the following questions: (1) Is there a functional relation between coaching TAs to use naturalistic behavioral teaching strategies (i.e., EMT) and TA fidelity of implementation?; (2) Is there a functional relation between TA's use of EMT and increases in child social communication skills?; and (3) Does TA's use of EMT generalize across children and social communication goals?

The results for each data analysis procedure, as described in the methods section, will be provided. This includes visual analysis of the data for measured TA behavior (i.e., fidelity of implementation) and all measured target student behavior (i.e., prompted target verbal requests, unprompted target verbal requests, total target verbal requests), in addition to interpretation of Hedges g effect sizes and tau-U for measured TA behavior and target student behavior. The mean and range MLU will be provided for each target student participant.

Visual analysis

Question one. *Is there a functional relation between coaching TAs to use naturalistic behavioral teaching strategies (i.e., EMT) and TA fidelity of implementation?*

The multiple baseline graph for percentage of steps implemented correctly is provided in *Figure 4*. This graph displays the observation data collected on TA fidelity of implementation of EMT during 15-minute play sessions with TA participants and target student dyads, in addition to generalization probes with non-target student dyads during baseline, coaching, and maintenance sessions. The outcomes related to

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generalization to non-target students will be discussed later in response to research question three. See *Table 17* for mean and range scores of TA's percentage of steps implemented correctly.

 Jillian. For Jillian, her mean percentage of steps implemented correctly was 23.88% (range: 15.38% – 30.60%) in baseline, 78.86% (range: 50.00% – 92.86%) during coaching, and 77.17% (range: 69.73% – 85.62%) during maintenance. This resulted in a gain of 54.98% steps implemented correctly between baseline and coaching and a gain of 53.29% steps implemented correctly between baseline and maintenance. Jillian's fidelity of implementation remained stable with little variability and no trend during baseline. There was a significant immediate change in level for Jillian's percentage of steps implemented correctly between baseline and coaching, with an increasing trend and little variability. Her data displayed a small change in level with decreasing fidelity of implementation during maintenance once coaching was removed (i.e., 92.30% – 76.92%) and remained relatively stable. Her data displayed an increasing trend in fidelity of implementation in her last maintenance sessions, following a review of EMT strategies with the lead researcher. There was no overlap between baseline and coaching phases and baseline and maintenance phases.

 Erin. Erin's mean percentage of steps implemented correctly was 27.64% (range: 16.67% – 28.57%) in baseline and 80.56 % (range: 50.00% – 92.30%) during coaching, resulting in a gain of 52.92% steps implemented correctly between baseline and coaching. Erin did not participate in a maintenance phase. Her fidelity of implementation remained stable with low variability and no trend during baseline. There was a significant and immediate increasing level for Erin's percentage of steps implemented

correctly between baseline and coaching (i.e., 18.18% to 76.92), which remained stable with minimal variability and no significant trend. There was one coaching session (i.e., session 19) during which her fidelity of implementation was unusually low compared with other coaching sessions (i.e., 50%), with no overlap between baseline and coaching phases.

Janice. Janice's mean percentage of steps implemented correctly was 26.17% (range: 16.67% – 50.00%) during baseline and 76.67% (range: 66.67% – 84.62%) during coaching. This resulted in a gain of 50.50% steps implemented correctly between baseline and coaching. Erin did not participate in a maintenance phase. Janice's fidelity of implementation was stable with little variability during baseline, except for session 8 in which her fidelity of implementation was higher than usual compared to other baseline sessions (i.e., 50%). There was no trend in data during baseline, and a significant and immediate change in level for Janice's percentage of steps implemented correctly between baseline and coaching sessions (i.e., 18.18% – 76.92%). Janice's fidelity of implementation remained stable with low variability during coaching sessions with no significant trend and no overlap with baseline.

Brianne. For Brianne, her mean percentage of steps implemented correctly was 37.17% (range: 23.07% – 64.29%) in baseline, 88.56 % (range: 83.33% – 92.86%) during coaching, and 82.56% (range: 78.57% – 85.00%) during maintenance. This resulted in a gain of 51.39% steps implemented correctly between baseline and coaching and a gain of 45.39% steps implemented correctly between baseline and maintenance, with an increasing trend in Brianne's fidelity of implementation during baseline. There was an immediate change in level for Brianne's percentage of steps implemented correctly

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between baseline and the introduction of coaching with a moderate increase in the percentage of steps implemented correctly (i.e., 69.23% to 83.33%). She displayed an increasing trend in steps implemented correctly during coaching sessions and her fidelity of implementation remained stable with little variability and no overlap with baseline. She displayed a small change in level with decreasing fidelity of implementation during maintenance sessions, once coaching was removed (i.e., 92.31% - 85%). Her fidelity of implementation remained stable with little variability during maintenance, with a decreasing trend.

Vertical analysis. Vertical analysis of the data suggests three clear demonstrations of the effect, with immediate increases in fidelity of implementation for Jillian, Erin and Janice upon introduction of coaching staggered across three baselines. It is more difficult to determine a demonstration of the effect regarding increases in Brianne's fidelity of implementation, since she had an increasing trend during baseline prior to the introduction of coaching. It is unclear whether Brianne's fidelity of implementation would have continued to increase regardless of receiving coaching, limiting inferences regarding the impact of coaching on her behavior. In addition, a vertical analysis of the data suggests concurrent increases in Brianne's fidelity of implementation and Erin's fidelity of implementation, upon introduction of coaching for Erin. This supports the hypothesis that Brianne may have learned to use some EMT strategies during baseline after discussing strategies with Erin or observed Erin using the strategies, since they were in the same classroom.

Table 18

Teaching Assistant Fidelity of Implementation

TA	Mean (B)	Mean (C)	Mean (M)	Range (B)	Range (C)	Range (M)
Jillian	23.88	78.86	77.17	15.38 – 30.60	50.00 – 92.86	69.73 – 85.62
Erin	27.64	80.56	NA	16.67 – 28.57	50.00 – 92.30	NA
Janice	26.17	76.67	NA	16.67 – 50.00	66.67 – 84.62	NA
Brianne	37.17	88.56	82.56	23.07 – 64.29	83.33 – 92.86	78.57 – 85.00

Note: (B) indicates baseline phase; (C) indicates coaching phase; (M) indicates maintenance phase.

Figure 4

Teaching Assistant Fidelity of Implementation

Teaching Assistant Fidelity of Implementation
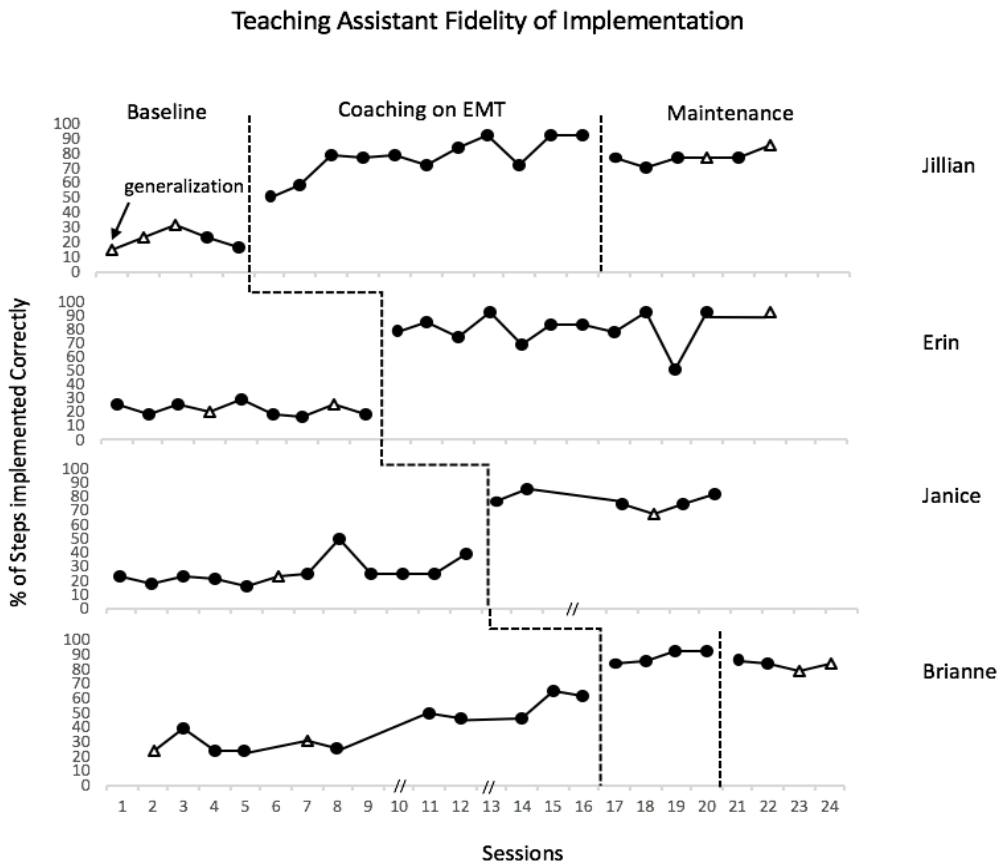
Question two. *Is there a functional relation between TA's use of naturalistic behavioral teaching strategies (i.e., EMT) and increases in student social communication skills?*

The multiple baseline graph for frequency of student prompted target verbal requests is displayed in *Figure 5*. The multiple baseline graph for frequency of student unprompted target verbal requests is displayed in *Figure 6.* The multiple baseline graph for frequency of student total target verbal requests is displayed in *Figure 7*. These graphs display the observation data collected on student behavior (i.e., prompted target verbal requests, unprompted target verbal requests, total target verbal requests) during 15-minute play sessions with TA participants and target student dyads during baseline and coaching/maintenance phases (i.e., TA implementation of EMT). See *Table 19* for mean and range scores for student prompted target verbal requests. See *Table 20* for mean and range scores for student unprompted target verbal requests. See *Table 21* for mean and range scores for student total target verbal requests.

Alana. Alana's mean frequency of prompted target verbal requests was 0.20 (range: 0 -1) during baseline and 3.25 (range: 1 – 6) during TA implementation of EMT. This resulted in a gain of 3.05 prompted target verbal requests between baseline and TA implementation of EMT. Her frequency of prompted target verbal requests remained stable with low variability and no trend during baseline. There was not a significant immediate change in level in her data between baseline and implementation of EMT; however, there was an increasing trend in her frequency of prompted target verbal requests during the first sessions of EMT and the last several sessions of EMT. Frequency of prompted target verbal requests remained variable throughout EMT

sessions; however, Alana had an overall higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, with several EMT sessions being significantly higher than the baseline average. There was some overlap between baseline and EMT sessions.

Alana's mean frequency of unprompted target verbal requests was 2.20 (range: 0 - 4) during baseline and 7.25 (range: 1 – 19) during TA implementation of EMT, resulting in a gain of 5.05 unprompted target verbal requests between baseline and TA implementation of EMT. Her frequency of unprompted target verbal requests remained stable with little variability and no trend during baseline. There was not an immediate change in level in Alana's data between baseline and implementation of EMT, but there was a significant change in level after several EMT sessions. There was a decreasing trend in frequency of unprompted target verbal requests during the last two sessions of EMT. Alana's TA did report that Alana had displayed increased challenging behavior in the classroom unrelated to the study during the last week of EMT. Frequency of unprompted target verbal requests remained highly variable throughout EMT sessions, however, Alana had a higher overall frequency of unprompted target verbal requests during EMT sessions than baseline sessions with several EMT sessions being significantly higher than the baseline average. There was significant overlap between baseline and EMT sessions.

Alana's mean frequency of total target verbal requests was 2.40 (range: 0 - 4) during baseline and 10.50 (range: 3 - 23) during TA implementation of EMT, resulting in a gain of 8.1 total target verbal requests between baseline and TA implementation of EMT. Her data was stable with low variability and no trend during baseline. There was

not an immediate increase in level in Alana's frequency of total target verbal requests

between baseline and implementation of EMT, but there was a significant change in level

after several EMT sessions. There was a decreasing trend in frequency of total target

verbal requests during the last two sessions of EMT.   As previously mentioned, Alana's

TA did report that Alana had displayed increased challenging behavior in the classroom,

unrelated to the study, during the last week of EMT. Frequency of total target verbal

requests remained highly variable throughout EMT sessions, but Alana had a higher

overall frequency of unprompted target verbal requests during EMT sessions than

baseline sessions. There was significant overlap between baseline and EMT sessions.

  Orlando. For Orlando, his mean frequency of prompted target verbal requests

was 0 during baseline (range: $0 - 0$) and 3.50 (range: $1 - 7$) during TA implementation of

EMT, resulting in a gain of 3.50 prompted target verbal requests between baseline and

TA implementation of EMT. His data was stable with little variability and no trend

during baseline, although data were only collected for two baseline data points. There

was an immediate and moderate increase in frequency of prompted target verbal requests

with the introduction of TA implementation of EMT, with an increasing trend during the

first several sessions of EMT and the last several sessions of EMT. Overall, Orlando had

a higher frequency of prompted target verbal requests during EMT sessions than baseline

sessions, with several EMT sessions being significantly higher than the baseline average

and no overlap between baseline and EMT sessions.

  Orlando's mean frequency of unprompted target verbal requests was 3.50 (range:

$0 - 7$) during baseline and 8.25 (range: $4 - 23$) during TA implementation of EMT. This

resulted in a gain of 4.75 unprompted target verbal requests between baseline and TA

implementation of EMT. There was an increasing trend in data during baseline, although data were only collected for two baseline data points. There was not an immediate increase in frequency of unprompted target verbal requests with the introduction of TA implementation of EMT, but overall, Orlando had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, especially during the last three sessions. There was some overlap in data between baseline and EMT sessions.

Orlando's mean frequency of total target verbal requests was 2.50 (range: 0 – 7) during baseline and 12.58 (range: 4 - 23) during TA implementation of EMT. This resulted in a gain of 10.08 total target verbal requests between baseline and TA implementation of EMT. Orlando's data displayed an increasing trend during baseline, although data were only collected for two baseline data. There was not an immediate change in level with the introduction of TA implementation of EMT, but overall, Orlando had a higher frequency of total target verbal requests during EMT sessions than baseline sessions, with several EMT sessions being significantly higher than the baseline average. There was some overlap in data between baseline and EMT sessions.

Owen. Owen's mean frequency of prompted target verbal requests was 0.20 (range: 0 – 1) during baseline and 2.57 (range: 0 - 8) during TA implementation of EMT. This resulted in a gain of 2.37 prompted target verbal requests between baseline and TA implementation of EMT. Owen's data remained stable with low variability and no trend during baseline. He had an immediate and moderate increase in level with the introduction of TA implemented EMT, with an increasing trend during the last several sessions of EMT. Overall, Owen had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, with several EMT sessions being

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significantly higher than the baseline average. There was some overlap between baseline and EMT sessions and there was high variability in frequency of prompted target verbal requests during EMT sessions.

Owen's mean frequency of unprompted target verbal requests was 1.20 (range: 0 – 2) during baseline and 3.40 (range: 1 - 9) during TA implementation of EMT, resulting in a gain of 2.20 unprompted target verbal requests between baseline and TA implementation of EMT. Owen's data remained stable with little variability and no trend during baseline. There was no immediate increase in level with the introduction of TA implementation of EMT; however, Owen had an overall higher frequency of unprompted target verbal requests during EMT sessions than baseline sessions. He had significantly more unprompted target verbal requests during several EMT sessions than the baseline average. There was in increasing trend in unprompted target verbal requests during EMT sessions. There was some overlap between baseline and EMT sessions and high variability in frequency of unprompted verbal requests during EMT sessions.

Owen's mean frequency of total target verbal requests was 1.40 (range: 1 – 2) during baseline and 6.21 (range: 2 - 16) during TA implementation of EMT. This resulted in a gain of 4.81 total target verbal requests between baseline and TA implementation of EMT. Owen's frequency of total target verbal requests remained stable with little variability and no trend during baseline. There was no immediate increase in level with the introduction of TA implementation of EMT and Owen's frequency of target verbal requests was highly variable during baseline. However, Owen had a higher overall frequency of total target verbal requests during EMT sessions than

baseline sessions, with several EMT sessions being significantly higher than the baseline average. There was an increasing trend in data during EMT sessions.

Adam. For Adam, his mean frequency of prompted target verbal requests was 0.20 (range: 0 – 1) during baseline and 1.86 (range: 0 - 7) during TA implementation of EMT. This resulted in a gain of 1.66 prompted target verbal requests between baseline and TA implementation of EMT. Adam's data remained stable with little variability and no trend during baseline. There was a small immediate increase in frequency of prompted target verbal requests with the introduction of TA implementation of EMT, with no significant trend and some variability. Overall, Adam had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, with several EMT sessions being significantly higher than the baseline average.

Adam's mean frequency of unprompted target verbal requests was 0.40 (range: 0 – 2) during baseline and 0.35 (range: 0 -2) during TA implementation of EMT. This did not result in a gain of unprompted target verbal requests between baseline and TA implementation of EMT. Adam's data remained stable with little variability and no trend during baseline. There was no increase in level with the introduction of TA implementation of EMT, with no significant trend during EMT sessions. Overall, Adam had a higher frequency of unprompted target verbal requests during baseline sessions than EMT sessions, although differences were minimal, with a significant overlap between baseline and EMT sessions.

Adam's mean frequency of total target verbal requests was 0.60 (range: 0 – 2) during baseline and 2.14 (range: 0 - 5) during TA implementation of EMT, resulting in a gain of 1.54 total target verbal requests between baseline and TA implementation of

EMT. Adam's data remained stable with little variability and no trend during baseline. There was not an immediate increase in frequency of total target verbal requests with the introduction of TA implementation of EMT, with no significant trend in total target verbal requests during EMT sessions. Overall, Adam had a higher frequency of total target verbal requests during EMT sessions than baseline sessions, with some EMT sessions significantly higher than baseline sessions. There was some overlap between baseline and EMT sessions, in addition to high variability in frequency of target verbal requests during EMT sessions.

Dylan. Dylan's mean frequency of prompted target verbal requests was 0.10 (range: 0 – 1) during baseline and 4.00 (range: 1 - 6) during TA implementation of EMT. This resulted in a gain of 3.90 prompted target verbal responses between baseline and TA implementation of EMT. Dylan's data remained stable with little variability and no trend during baseline. There was not an immediate increase in frequency of prompted target verbal requests with the first session of EMT. However, there was significant increase in the second session of EMT. Data remained stable during EMT sessions with no significant trend and low variability. Overall, Dylan had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, with almost all EMT sessions being significantly higher than the baseline average, with little overlap between baseline and EMT sessions.

Dylan's mean frequency of unprompted target verbal requests was 0.10 (range: 0 – 1) during baseline and 1.60 (range: 1 - 6) during TA implementation of EMT, resulting in a gain of 1.50 unprompted target verbal requests between baseline and TA implementation of EMT. Dylan's data remained stable with little variability and no trend

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during baseline. There was not an immediate increase in frequency of unprompted target verbal requests with the first session of EMT, but there was a moderate increase in the third session of EMT. Data remained stable during EMT sessions with no significant trend and low variability. Overall, Dylan had a higher frequency of unprompted target verbal requests during EMT sessions than baseline sessions, with most EMT sessions being higher than the baseline average. There was some overlap between baseline and EMT sessions.

Dylan's mean frequency of total target verbal requests was 0.40 (range: 0 – 2) during baseline and 5.60 (range: 1 - 9) during TA implementation of EMT, resulting in a gain of 5.20 total target verbal requests between baseline and TA implementation of EMT. Dylan's data was stable with low variability and no trend during baseline. There was not an immediate increase in level with the first session of EMT, but a significant change in level during the second session of EMT. Data remained stable during EMT sessions with no significant trend and little variability. Overall, Dylan had a higher frequency of total target verbal requests during EMT sessions than baseline sessions. There was very little overlap between baseline and EMT sessions.

Leah. For Leah, her mean frequency of prompted target verbal requests was 1.83 (range: 0 – 6) during baseline and 5.83 (range: 0 - 6) during TA implementation of EMT. This resulted in a gain of 4.00 prompted target verbal requests between baseline and TA implementation of EMT. Leah's data were highly variable during baseline. There was an immediate increase in frequency of prompted target verbal requests with the introduction of EMT, with no significant trend during EMT sessions. There was also significant overlap between phases. It may be that Leah had a higher frequency of prompted target

verbal requests during baseline than other participants, since the TA (i.e., Brianne) was using some environmental arrangement strategies and most-to-least prompting during baseline sessions with Leah. Overall, Leah had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, and data during EMT sessions were less variable than during baseline.

Leah's mean frequency of unprompted target verbal requests was 0.83 (range: 0 – 4) during baseline and 2.50 (range: 0 - 8) during TA implementation of EMT. This resulted in a gain of 1.67 unprompted target verbal requests between baseline and TA implementation of EMT. Leah's data were stable during baseline with no trend. There was an immediate and significant increase in frequency of unprompted target verbal requests with the introduction of TA implemented EMT, with no significant trend during EMT sessions. There was significant overlap between phases and data during EMT sessions were variable. Overall, Leah had a higher frequency of prompted target verbal requests during EMT sessions than baseline sessions, with some EMT sessions being significantly higher than baseline sessions.

Leah's mean frequency of total target verbal requests was 2.67 (range: 0 – 6) during baseline and 8.33 (range: 1 - 9) during TA implementation of EMT, resulting in a gain of 5.66 total target verbal requests between baseline and TA implementation of EMT. Leah's data were highly variable during baseline. There was an immediate increase in level with the introduction of TA implemented EMT, with no significant trend during EMT sessions. There was significant overlap between phases. Overall, Leah had a higher frequency of total target verbal requests during EMT sessions than baseline sessions.

Esther. Esther's mean frequency of prompted target verbal requests was 0.17

(range: 0 – 1) during baseline and 2.30 range: 1 – 5) during TA implementation of EMT.

This resulted in a gain of 2.13 prompted target verbal requests between baseline and TA

implementation of EMT. Esther's data were stable during baseline, with no significant

trend. There was an immediate and significant change in level with the introduction of

EMT, with no significant trend during EMT sessions. There was some overlap in data

between baseline and EMT sessions and data was variable. Overall, Esther had a higher

frequency of prompted target verbal requests during EMT sessions than baseline sessions.

Esther's mean frequency of unprompted target verbal requests was 0.83 (range: 0

– 2) during baseline and 1.14 (range: 1 – 2) during TA implementation of EMT, resulting

in a gain of 0.31 unprompted target verbal requests between baseline and TA

implementation of EMT. Her data were stable during baseline, with no significant trend.

There was no increase in frequency of unprompted target verbal requests with the

introduction of EMT and no significant trend during EMT sessions. There was

significant overlap in data between baseline and EMT sessions. Overall, Esther had a

higher frequency of prompted target verbal requests during EMT sessions than baseline

sessions, but differences are minimal.

Esther's mean frequency of total target verbal requests was 1.00 (range: 0 – 2)

during baseline and 3.45 (range: 2 – 6) during TA implementation of EMT. This resulted

in a gain of 2.45 total target verbal requests between baseline and TA implementation of

EMT. Esther's data were stable during baseline, with no significant trend. There was an

immediate and small increase in frequency of total target verbal requests with the

introduction of EMT, with no significant trend during EMT sessions. There was some

overlap in data between baseline and EMT sessions and data was stable. Overall, Esther had a higher frequency of total target verbal requests during EMT sessions than baseline sessions.

Vertical analysis. Vertical analysis of the data suggests there were at least six demonstrations of the effect for prompted student verbal requests for Alana, Orlando, Owen, Adam, Dylan and Esther upon introduction of coaching staggered across four baselines. It is difficult to determine if there was a functional relation between the implementation of EMT and increased prompted student verbal requests for Leah, due to the overlap in data between phases.

Vertical analysis of the data suggests there were at least five demonstrations of the effect for unprompted student verbal requests for Alana, Orlando, Owen, Dylan and Esther upon introduction of coaching staggered across four baselines. It is difficult to determine if there was a functional relation between the implementation of EMT and increased unprompted student verbal requests for Leah, due to the overlap in data between phases. In addition, there was no increase in Adam's unprompted target verbal requests upon introduction of TA implemented EMT.

Vertical analysis of the data suggests there were seven demonstrations of the effect for total target verbal requests for Alana, Orlando, Owen, Adam, Dylan, Leah, and Esther upon introduction of coaching staggered across four baselines.

Table 19

Student Prompted Target Verbal Requests

Student	Average baseline	Average EMT	Range baseline	Range EMT
Alana	0.20	3.25	0 -1	1 – 6
Orlando	0.00	3.50	0 – 0	1 – 7
Owen	0.20	2.57	0 – 1	0 – 8
Adam	0.20	1.86	0 – 1	0 – 7
Dylan	0.10	4.00	0 – 1	1 – 6
Leah	1.83	5.83	0 – 6	1 – 9
Esther	0.17	2.30	0 – 1	1 – 5

Table 20

Student Unprompted Target Verbal Requests

Student	Average baseline	Average EMT	Range baseline	Range EMT
Alana	2.20	7.25	0 – 4	1 – 19
Orlando	3.50	8.25	0 – 7	4 - 23
Owen	1.20	3.40	0 – 2	1 – 9
Adam	0.40	0.35	0 – 2	0 - 1
Dylan	0.10	1.60	0 – 1	0 – 4
Leah	0.83	2.50	0 – 4	0 – 8
Esther	0.83	1.14	0 – 2	1 – 2

Table 21

Student Total Target Verbal Requests

Student	Average baseline	Average EMT	Range baseline	Range EMT
Alana	2.40	10.50	0 – 4	3 -23
Orlando	2.50	12.58	0 – 7	4 – 23
Owen	1.40	6.21	1 – 2	2 – 16
Adam	0.60	2.14	0 – 2	0 -5
Dylan	0.40	5.60	0 – 2	1 – 9
Leah	2.67	8.33	0 – 6	3 – 13
Esther	1.00	3.45	0 – 2	2 – 6

Figure 5

Frequency of Student Prompted Target Verbal Requests

Student Prompted Target Mands
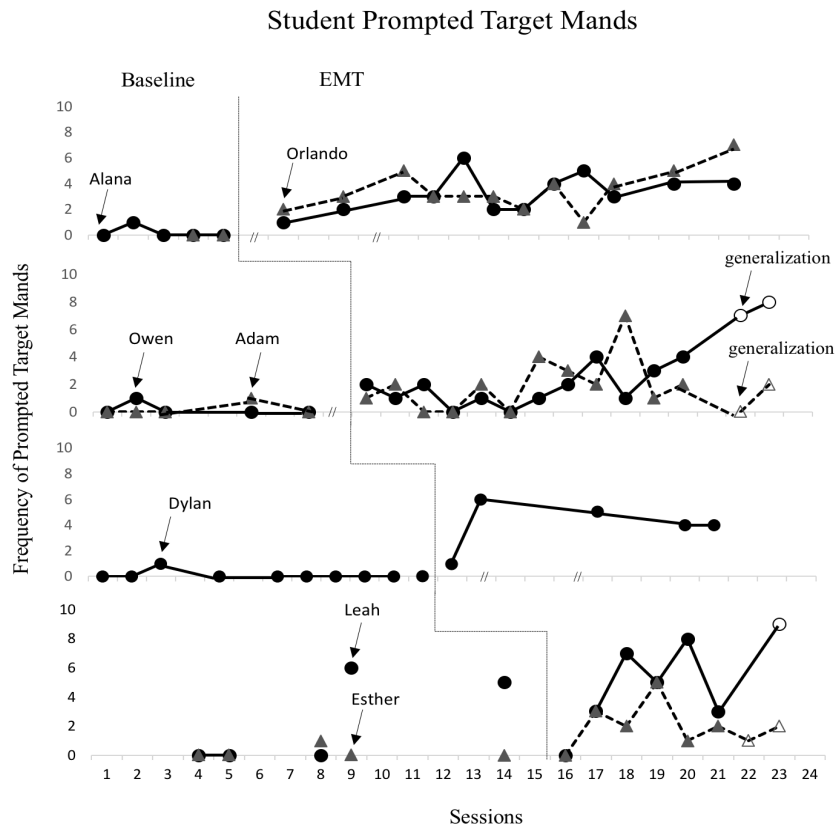
Figure 6

Frequency of Student Unprompted Target Verbal Requests

Student Unprompted Target Mands
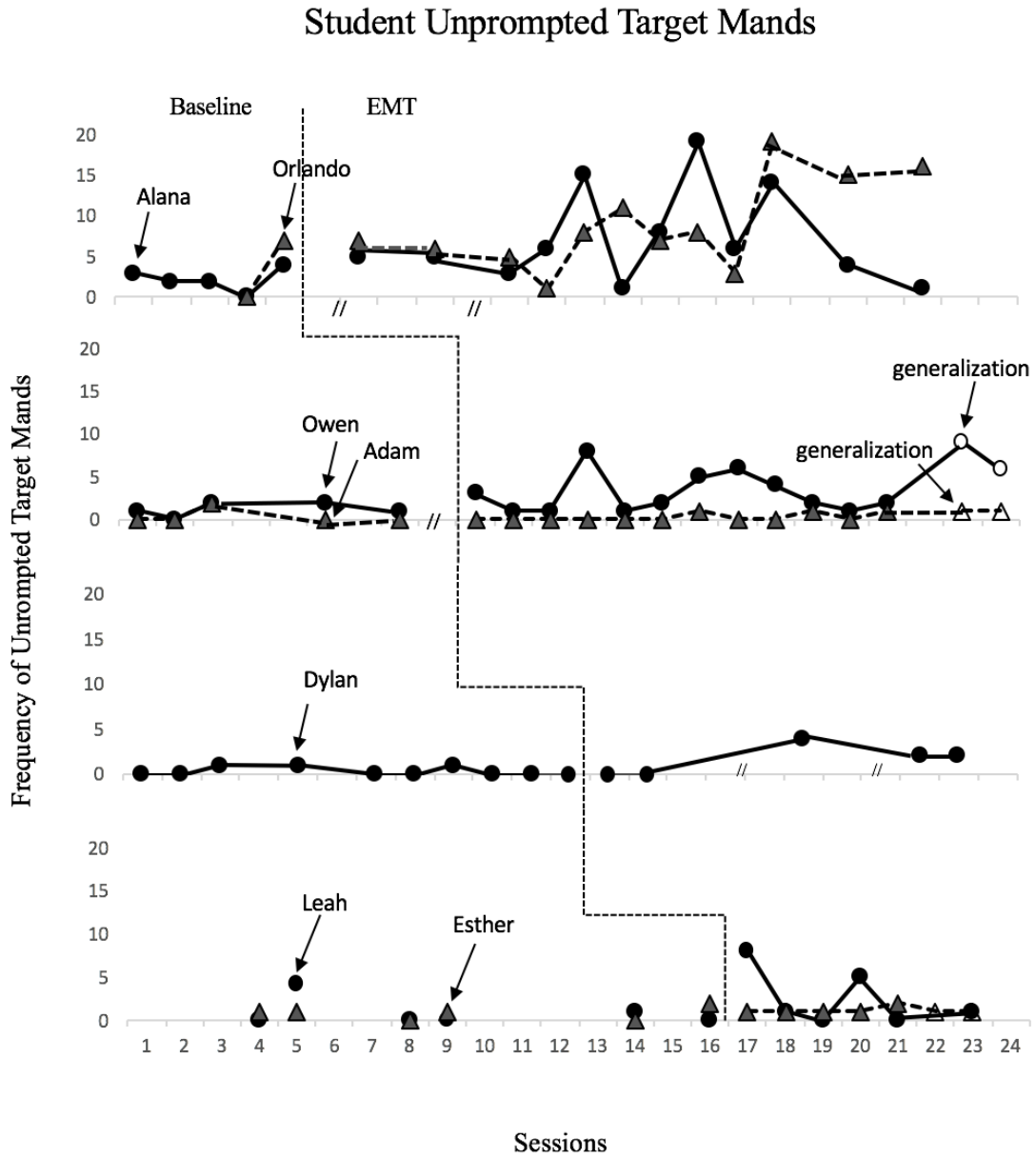
Figure 7

Frequency of Student Total Verbal Requests

Student Total Target Mands
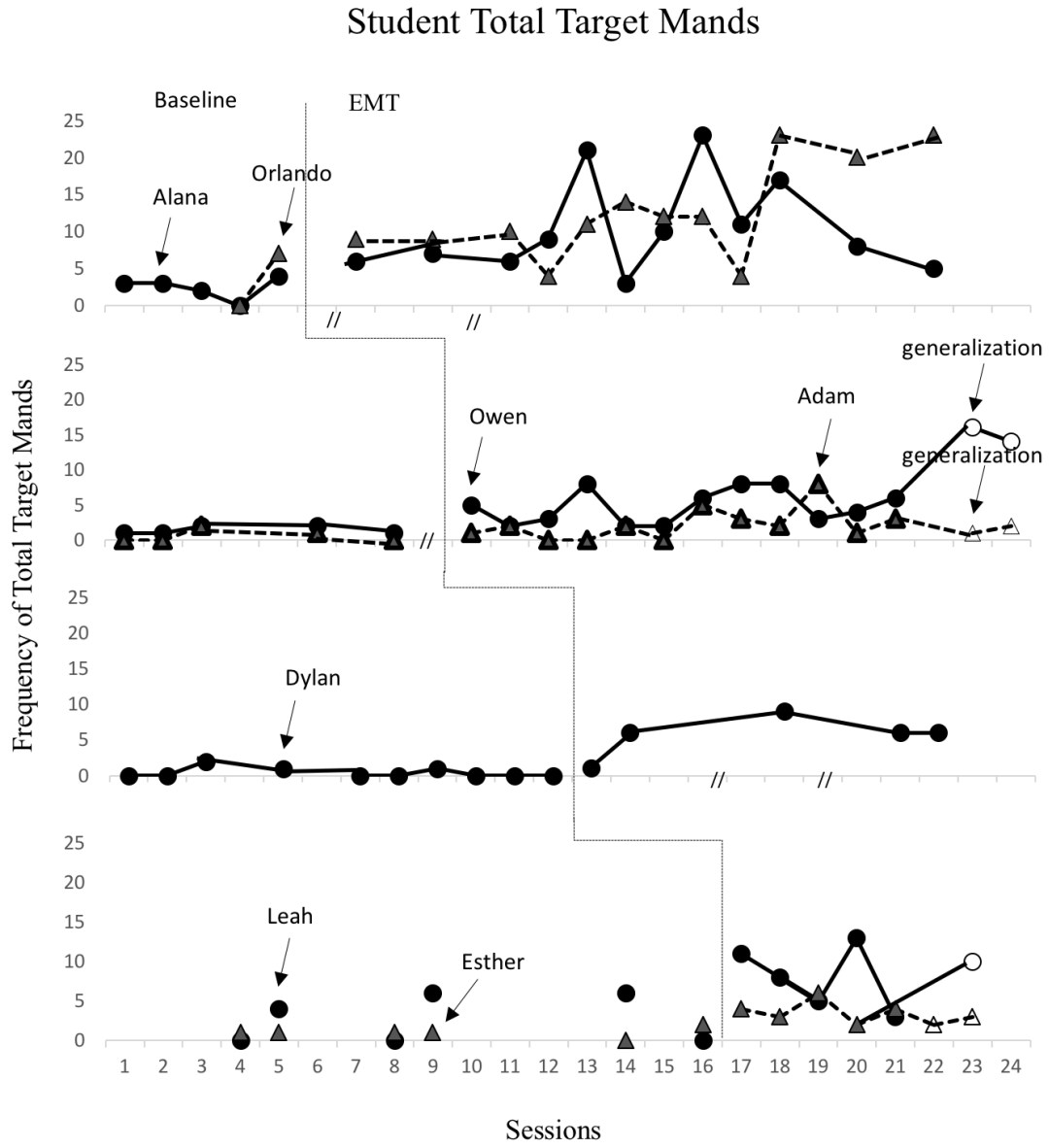
Question three. *Does TA's use of EMT generalize across children and social communication goals?* For all TA participants, there was an immediate and significant increase in fidelity of implementation of EMT strategies upon the introduction of coaching or maintenance sessions during generalization probes. There was no overlap in data between baseline and coaching or maintenance sessions for any of the TA participants during generalization probes. Although generalization probes were limited, generalization data suggests TAs were able to generalize EMT strategies across different students with various levels of social communication skills.

Effect sizes

The randomization procedure used in this study allowed for the calculation of a between subject effect size, Hedges *g*. Hedges *g* effect sizes were calculated for both TA data (i.e., fidelity of implementation) and student data (i.e., prompted target verbal requests, unprompted target verbal requests, and total target verbal requests) and compared to Cohen's *d* guidelines (Cohen, 1988) to determine the magnitude of effect. These effect sizes should be interpreted with caution, since single-case research often produces large effect sizes that are not sensitive to high variability in data and are likely not directly comparable to group design research effect sizes (Parker, Brossart, & Vannest, 2005). In addition, the data from the current research study included zero values in baseline, which can bias the DHPS Macro's interpretation of results (Hedges et al., 2015).

Question one. In regards to TA fidelity of implementation, the overall effect size was $g = 4.59$, indicating a large effect.

Question two. In regards to student prompted target verbal requests, the overall effect size was $g = 2.07$, indicating a large effect. For student unprompted target verbal requests, the overall effect size was $g = 0.40$, indicating a small to medium effect. For student total target verbal requests, the overall effect size was $g = 0.72$, indicating a medium to large effect.

Tau-U

In addition to effect sizes, Tau-U was calculated for both TA data and child data to determine the effectiveness coaching on TA fidelity of implementation and the effectiveness of TAs' implementation of EMT on child social communication skills. An online Tau-U calculator was used (http://www.singlecaseresearch.org/calculators) and the author controlled for trend in baseline. A Tau-U of 1 or -1 indicates there were no overlapping data between phases.

Question one. In regards to TA fidelity of implementation, the weighted Tau-U was .89. Tau-u was 1 for all TA participants except for Brianne, which corresponds with visual analysis that there were no overlapping data between baseline and coaching/maintenance phases. Tau-U for Brianne was 0.59. While there were no overlapping data for Brianne, her calculated Tau-U may be explained by the increasing trend in Brianne's fidelity of implementation during baseline.

Question two. In regards to student prompted target verbal requests, the weighted Tau-U was .85, indicating minimal overlap. Tau-U for student prompted target verbal requests ranged from .63 to 1 for individual student participants. This corresponds with visual analysis of the data that there was moderate to no overlap in data between phases. For student unprompted verbal requests, the weighted Tau-U was .42, indicating

moderate to significant overlap. Tau-U for student unprompted target verbal requests ranged from .09 to .67 for individual student participants. This corresponds with visual analysis of the data that there was significant to moderate overlap in data between phases. For student total prompted verbal requests, the weighted Tau-U was .72, indicating minimal to moderate overlap. Tau-U for student total target verbal requests ranged from .23 to .93 for individual student participants. This corresponds with visual analysis of the data suggesting there was significant to minimal overlap in data between phases. See *Table 22* for a summary of effect sizes and Tau-U.

Table 22

Summary of Statistical Analysis

Dependent variable	Hedges *g*	Tau-U
TA fidelity of implementation	4.59	.89
Student prompted target verbal requests	2.07	.85
Student unprompted target verbal requests	0.40	.42
Student total target verbal requests	0.72	.72

Mean length of utterances (MLU)

Data on target student MLU were collected for Alana, Orlando, Owen, Adam, Leah, and Esther and calculated for each student from two randomly language samples taken during baseline and two language randomly samples taken during TA implementation of EMT. MLU increased from baseline to TA implementation of EMT for all target students. See *Table 23* for a summary of MLU data.

Table 23

Mean Length of Utterances (MLU) by Target Student

Child	Average (baseline)	Average (EMT)	Mean average increase	Range (baseline)	Range (EMT)
Alana	3.37	3.86	0.49	3.24 – 3.49	3.58 – 4.14
Orlando	2.31	3.19	0.88	1.87 – 2.75	3.12 – 3.25
Owen	0.89	1.67	.78	.80 - .98	1.44 – 1.90
Adam	1.99	2.54	.55	1.94 – 2.05	2.53 – 2.54
Leah	0.19	0.74	.55	0.00 – 0.38	0.67 – 0.81
Esther	1.32	1.76	.44	1.12 – 1.52	1.44 – 2.07

Note: Data based on four language samples, including two language samples taken during baseline and two language samples taken during intervention.

Summary

The current chapter provided a description of TA and student outcomes for this research study. TA and student data were analyzed through visual analysis and statistical analysis, including Hedges *g* effect sizes and Tau-U. Visual and statistical analysis of the data suggest coaching had a significant effect on TA's increased fidelity of implementation of EMT strategies. Visual and statistical analysis of the data suggest mixed, but promising results for student outcomes, including prompted target verbal requests, unprompted target verbal requests, and total target verbal requests. The current chapter also described gains in student MLU for Alana, Orlando, Owen, Adam, Leah and Esther by comparing language samples for each student taken during baseline and EMT

sessions. The subsequent chapter will provide a discussion of the results, limitations of

this research study, implications of this research study, and future directions for research.

CHAPTER V

DISCUSSION

A discussion of the results of each research question is presented, in addition to

the study limitations, future directions, and implications of the current study. First, the

purpose and methods are summarized. Next, an interpretation of the results for each

research question is provided, followed by limitations of the current research study and

areas for future research.

Purpose and Method

Promoting social communication skills is a critical goal for preschool children,

especially those with Developmental Disabilities, because not only are these children at

increased risk for social communication delays (Landa, Holman, Garret-Mayer, 2007;

Mitchell, Zwaigenbaum, Roberts, Szatmari, Smith, & Bryson, 2006; Van Der Schuit,

Peeters, Segers, Van Balkom, & Verhoeven, 2009), but they also have difficulty

generalizing newly learned social communication skills to everyday social interactions

(Chandler, Lubeck, & Fowler, 1992; Hancock & Kaiser, 2002; Kaiser & Trent, 2007). In

addition, social communication skills have a long-term impact children's subsequent

learning and development (Strain & Hoyson, 2000).

Effective social communication interventions for young children with DD should

include teaching strategies that support not only the acquisition, but also the

generalization and maintenance of child social communication skills (Bottema-Beutel,

2014; Cowan & Allen, 2007; Hancock & Kaiser, 2000; Hemmeter & Kaiser, 2004;

Kaiser, Hancock & Nietfield, 2000, McCathren, 2000; Kaiser & Trent, 2007).   This may

be achieved by having natural change agents, with whom the child regularly interacts,

teach social communication skills within daily activities and routines in the natural environment (Kaiser, 1993; Kaiser & Roberts, 2013), such as during free play in the preschool classroom.

Naturalistic behavioral interventions, including EMT, are supported by a breadth of research as recommended for increasing child social communication skills (e.g., Coolican, Smith, & Bryson, 2010; Harjusola-Webb & Robbins, 2012; Hemmeter & Kaiser, 2004; Ingersoll, 2011; Kaiser & Trent, 2007; Robinson, 2011) and have been considered evidence-based practices (National Autism Center, 2015). It is beneficial to incorporate naturalistic behavioral interventions, such as EMT, in inclusive preschool classrooms with the goal of helping children with DD gain access to learning opportunities through more successful social interactions with natural communication partners, such as TAs (Kaiser & Trent, 2007; Koegel & Koegel, 1995; Wetherby & Woods, 2006)

TAs are appropriate interventionists for teaching social communication skills, since paraprofessionals spend a large amount of time directly working with children in the natural environment of the preschool classroom. In addition, using TAs as interventionists is a cost-effective way to provide direct intervention to children with DD (Hughes & Valle-Riestra, 2008). However, adequate training and coaching is necessary for TAs to be effective interventionists (Rispoli et al., 2011) and many TAs lack appropriate training (Carter, O'Rourke, Sisco, & Pelsue, 2009; Giangreco, Broer, & Edelman, 1999; Hilton & Gerlach, 1997). In addition, TAs would benefit from learning to use EMT strategies with more than one child at a time in the preschool classroom,

since TAs are often working with multiple children with various social communication goals.

Limited research exists on training or coaching TAs to use interventions targeting social communication skills among children with DD (Mrachko & Kaczarmeck, 2017). The current research study aims to address gaps in the literature regarding paraprofessional roles related to increasing social communication skills for preschool children with DD.

Four TAs and seven students with DD were recruited from three reverse inclusion preschool classrooms in a small city in the Pacific Northwest region of the United States. Each TA was paired with a student dyad from their corresponding classroom and participated in 15-minute play interactions during free- play with the student dyad throughout all phases of the study. Each target student was assigned a target length of verbal requests by the lead researcher, based on their mean length of verbal requests during baseline. Following baseline, TAs received a two-hour training on the use of EMT strategies, followed by coaching with direct feedback on the use of EMT strategies from the lead researcher during 15-minute play interactions in the preschool classroom. If TAs were able to implement EMT with 90% fidelity across two consecutive sessions, they participated in maintenance sessions during which they received no feedback from the lead researcher. Data were collected for every session across phases on TA fidelity of implementation of EMT strategies and student prompted target verbal requests, unprompted target verbal requests, and total target verbal requests. Procedural fidelity data was collected for 85% of coaching sessions. Additionally, social validity data were

collected on lead teacher and TA perceptions of utility, acceptability, and feasibility of the intervention

Summary of Results

Question one

Is there a functional relation between coaching TAs to implement EMT and increases in TA fidelity of implementation of EMT? Visual analysis indicates there was a strong functional relation between coaching TAs to implement EMT and increases in TA fidelity of implementation of EMT, and statistical analyses suggest a large magnitude of the effect of coaching on TA behavior. Three of the four TAs demonstrated a significant change in level upon introduction of coaching, and the effect maintained throughout the coaching phase. The fourth TA participant demonstrated an increasing trend in data during baseline, but there was a moderate increase in level upon introduction of coaching and all coaching sessions. The fourth TA participant was in the same classroom as the second TA participant, which may explain her increased use of EMT strategies during baseline. It is possible she may have observed the other TA using EMT strategies. Only two TAs participated in maintenance sessions and data remained significantly above baseline levels during maintenance sessions. The calculated effect size (i.e., Hedges *g*) corresponds to visual analysis of the data, indicating a large effect. The calculated Tau-U indicates minimal overlap between phases, which corresponds to visual analysis of the data that there was no overlap between phases.

Question two

Is there a functional relation between TA implementation of EMT and increases in student social communication skills? Although results are variable by student, overall

results are promising. Visual analysis suggests there is a functional relation between implementation of EMT and increases in student prompted target verbal requests, student unprompted target verbal requests, and total target verbal requests. Statistical analyses indicate small to large magnitudes of the effect of TA implementation of EMT on target student behavior. In addition, all students demonstrated increases in MLU during TA implementation of EMT in comparison to baseline sessions.

Six of the seven target students demonstrated increases in level of prompted target verbal requests upon introduction of EMT, although changes in level were not always immediate. Only one of the seven target students did not demonstrate any significant increases in level of prompted target verbal requests. This may have occurred because the student was already using several verbal requests, using the same mand frame "I want _____", so the TA did not expect him to expand on his verbal requests before providing reinforcement. The calculated effect size (i.e., Hedges g) corresponds to visual analysis of the data, indicating a large effect. The calculated Tau-U indicates that there was minimal to moderate overlap between phases, which corresponds to visual analysis of the data.

Five of the seven target students demonstrated increases in level of unprompted target verbal requests upon introduction of EMT, although changes in level were not always immediate. One of the seven students did not demonstrate any increases in level of unprompted target verbal requests. The other student had significant overlap in data between baseline and EMT sessions, so it is difficult to determine if there was a functional relation between EMT and increases in unprompted target verbal requests. The calculated Hedges g corresponds to visual analysis of the data, indicating a small to

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moderate effect. The calculated Tau-U indicates that there was moderate to significant overlap between phases, which corresponds to visual analysis of the data.

All seven students demonstrated increases in level of total target verbal requests upon introduction of EMT, although changes in level were not always immediate. The calculated Hedges g corresponds to visual analysis of the data, indicating a moderate to large effect. The calculated Tau-U indicates that there was moderate overlap between phases, which corresponds to visual analysis of the data.

It is important to note that previous research on the use of naturalistic behavioral teaching strategies has demonstrated an increase in child social communication skills after six to thirty weeks (i.e., Snyder et al., 2015). Students in the current study received EMT for only three to eight weeks due to the time constraints of the school year. It is unlikely that any significant increases in child social communication skills can be determined, due to the short duration of the current study. It is especially unlikely that there were any significant increases in unprompted verbal requests, since that is a more distal outcome. There is also significant variability expected with social communication skills. Since least-to-most prompting was used, it is expected that unprompted target verbal requests will increase over time.

Question three

Were TAs able to generalize the use of EMT strategies across students with various social communication skills? Data suggests that TAs were able to generalize the use of EMT strategies across students with various social communication skills. Generalization probes were collected for $1 - 3$ sessions during baseline and $1 - 2$ sessions during coaching/maintenance phases. All TAs had low levels of fidelity of

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implementation of EMT during baseline generalization probes. There was a significant

increase in the level of fidelity of implementation for generalization probes conducted

during coaching/maintenance phases for all TAs.

The current study used a "train loosely" approach to generalization, in addition to

training across multiple exemplars (Stokes & Baer, 1977). TAs were exposed to a variety

of play materials and multiple students with varying levels of social communication

skills. The goal was that by conducting sessions with a variety of play materials with

more than one student, the skills learned during coaching sessions might generalize to

other students in the classroom during typical free play with any play materials available

in the classroom.

Social validity

What are lead teacher's and TAs' perceptions of the feasibility and acceptability

of the goals, procedures and intervention outcomes? All of the lead teachers and TAs

responded favorably to the intervention. However, data were only collected for two of

the three lead teachers. Several TAs reported anecdotally that they learned valuable skills

for prompting student social communication and play after participating in training and

coaching. Several TAs also reported that they learned valuable information about

individual student social communication skill levels and what students are actually

capable of communicating. Jillian reported that she observed significant increases in

social initiations toward herself from Orlando, that had generalized to the classroom

following participation in this research study. Prior to the study, she reported that

Orlando did not initiate social interactions with adults in the classroom at all. This is

important because increased social interactions with adults in the classroom provide more

learning opportunities for students. She also reported that she had generalized the use of environmental arrangement strategies to other students in the classroom throughout the day.

<div align="center">**Limitations**</div>

Despite the methodological rigor of the current study, there were several limitations. In classroom three, there was only one consented target child. Therefore, another peer from the classroom was used as part of the dyad, but no data were collected on the other student. Although the lead researcher tried to keep the peer consistent, another peer was sometimes used due to absences or delays in bus arrival.   Three peers participated during the study. Two peers participated during both baseline and intervention and the third peer participated during intervention only. In the other classrooms, TAs consistently worked with the same child dyad, except for during generalization probes. It may be that TA and student outcomes varied depending on the participating peer, possibly weakening the experimental control of the study.

In addition, there were two TAs in classroom two (i.e., second and fourth position within the multiple baseline design) which may have also impacted the experimental control of the study. It is possible that TA four (i.e., Brianne) learned EMT strategies indirectly after TA two (i.e., Erin) began participating in coaching, contributing to an increasing trend in her behavior during baseline. This may have also impacted student behavior, since Brianne was using both environmental arrangement strategies and most-to-least prompting strategies during baseline.

Another limitation of the current study was that some sessions did not reach 15-minutes, due to the length of transitions or delays in bus arrival. Studies were only coded

if they were at least 12-minutes long. There may be differences in the percentage of behaviors observed or frequency of student behaviors observed depending on the length of the observation period. However, sessions less than 15-minutes long occurred during both baseline and intervention phases, so this did not likely have a significant effect on data indicating changes in behavior across phases.

An additional limitation of the current study was that there were some missing data. Data from the CDI were missing for three of the student participants, limiting the generalizability of findings to students with similar language levels. However, data on student social communication skills taken from the VB-MAPP and language samples are available for these participants. Social validity data are also missing from the lead teacher from one of the participating classrooms, limiting findings related to lead teachers' perceptions of the intervention. Student data are also missing for some sessions, due to problems with audio for some videos used for video observations of student behavior. In addition, there were several missing sessions for the last tier (i.e., Brianne, Leah, Esther) during baseline due to the TA's frequent absences. Her attendance was more consistent throughout coaching and maintenance phases.

As previously mentioned, another limitation of the current study was the short duration of EMT sessions. Since EMT was only implemented for three to eight weeks across participants, it is difficult to determine the effect of EMT on target students. Social communication skills, especially spontaneous social communication skills (e.g., unprompted verbal requests), are more distal outcomes that are observed after a longer period of time receiving regular intervention.

Finally, the current study has limited generalization and maintenance data. TAs participated in only one to three generalization sessions during baseline and one to two generalization sessions during coaching or maintenance. Only two TAs participated in maintenance sessions, during which time TAs no longer received coaching. Due to the time constraints of the school year, no follow-up data were taken. Therefore, it is difficult to determine the long-term effects of the intervention. For example, it is unclear whether or not TAs will continue to use EMT with fidelity over time without coaching. It is also difficult to determine if any gains in student social communication skills continue in the long-term, or if social communication skills continue to improve over time.

Future Research

The goal of the current study is to better understand how to effectively deliver paraprofessional development on enhancing student social communication skills and assess the impact of paraprofessional development on subsequent student social communication outcomes. Future research should continue to examine successful paraprofessional development among TAs working with children with DD in early childhood settings, since there has been limited research in this area.

In the current study, TAs were taught to implement EMT with a child dyad. The rationale for working with two students at a time was that TAs are often working with multiple children at a time and often with children with varying social communication skills. Since no previous research has examined TA's use of strategies with more than one child at a time, the current study focused on working with two children. Future

research should examine TA's use of EMT strategies with small groups of children (e.g., 3 – 5 children) to more accurately reflect the natural environment in the classroom.

The current study demonstrated that TAs, with a wide variety of occupational and educational experience, can be trained and coached to successfully implement EMT with high levels of fidelity with a child dyad. Training and coaching procedures that have been successfully used in previous research studies (e.g., Hall et al., 2010; LeBlanc, Ricciardi, & Luiselli, 2005; Mazurik-Charles & Stefanou, 2010; Robinson et al., 2011) were used in the current study, including didactic instruction, modeling, role-play, and direct performance feedback. Since these procedures were used as a comprehensive training and coaching package, it is unclear which training and coaching procedures had the greatest impact on TA behavior. Future research should include a component analysis of training and coaching procedures, in an effort to add to the literature on efficient and cost-effective procedures for paraprofessional development.

Future research would also benefit from a component analysis of EMT. Similar to other naturalistic behavioral teaching strategies, EMT is a comprehensive intervention that uses a combination of developmental and behavioral strategies. It is unclear which strategies are most effective or necessary for improved child outcomes. A component analysis of EMT would help to identify the "active ingredients" of the intervention. Although it is most likely that all EMT strategies are important, identifying these "active ingredients" would allow researchers and practitioners to more efficiently train a greater number of TAs to promote child social communication skills, since it would require training TAs in fewer strategies, requiring less time and being more cost-effective.

Future research should also examine maintenance of TA fidelity of implementation of EMT over time. It is important that TAs not only learn to use EMT strategies with fidelity, but continue to use strategies with accuracy after coaching has been removed. It is unclear whether or not training and coaching had a long-term impact on TA behavior, due to limited maintenance data and no follow-up data. It may be that TAs are unable to maintain fidelity of implementation of EMT strategies in the long-term without coaching. Future research would also benefit from examining specific strategies for maintaining learned skills, such as self-monitoring or video-feedback, in order to ensure the sustainability of the intervention.

Future research should also continue to evaluate the generalization of TA's fidelity of implementation of EMT. In the current study, generalization of TA behavior was examined across students. However, it is also of importance to examine generalization of TA behavior across settings (e.g., playground), activities (e.g., small groups, snack,) and materials (e.g., sensory, art, pretend play).

Finally, future research would benefit from evaluating how to more efficiently train paraprofessionals, in order to produce more sustainable outcomes. In the current study, all TAs were trained individually by the lead researcher. It is uncommon for paraprofessionals to have a coach available to work with them directly in the preschool classroom over an extended period of time. Examining other approaches, including a "train-the-trainer" approach, may be valuable. For example, lead classroom teachers may be coached to implement EMT strategies with high levels of fidelity and then be trained to coach TAs to implement EMT strategies using the same direct coaching strategies as

used in the current study. This approach would allow for more efficient training of a greater number of individuals working directly with children with DD.

Implications for Practice

It is important to target social communication skills early during the preschool years among children with DD, since social communication skills are linked to other important outcomes, including improved social interactions with adults and peers (Embry, 1981; Rice, 1993), reduced challenging behavior (Matson, Boisjoli, & Mahan, 2009; Reichle, 1993; Sigafoos, 2000), and academic success (Agostin & Bain, 1997; McLelland, Frederick, Morrison, & Holmes, 2000; Welsh, Parke, Widaman & O'Neil, 2001). Importantly, improved social communication skills promote access to learning opportunities in the preschool classroom through social interactions with classroom staff and peers.

Preschool staff, including TAs, should have knowledge of evidence-based practices for enhancing child social communication skills among children with DD, in order to improve child outcomes. However, as previously mentioned, TAs receive limited training and support in delivering evidence-based practices (Carter, O'Rourke, Sisco, & Pelsue, 2009; Giangreco, Broer, & Edelman, 1999; Hilton & Gerlach, 1997), which is a disservice to preschool children receiving EI/ECSE services.

In addition, TAs should be trained to use evidence-based social communication interventions with small groups of children, since TAs are generally not working with one individual child at a time in the preschool classroom. The current study suggests

TAs can be taught to implement evidence-based practices for promoting social communication skills with more than one child at a time, as well as generalize strategies to children with different levels of social communication and play skills. It is important for TAs to be able implement social communication teaching strategies in the context of the natural environment of the preschool classroom, in which children do not typically receive one-to-one support, as well as be prepared to serve the diverse needs of all students in the classroom.

Effective paraprofessional development is a crucial goal in providing quality EI/ECSE services, due to the increased hours paraprofessionals spend working with children with DD. Although paraprofessionals can have a positive impact on child development, previous research suggests that didactic/preservice workshops alone only produce temporary behavior change among adult learners (Carter, Rispoli, Neely, Lang & Ganz, 2011; Giangreco & Broer, 2007; Rispoli, Neely, Lang & Ganz, 2011). The current study adds to preexisting literature, suggesting feedback and modeling are effective coaching strategies, since together they offer trainees opportunities to see strategies demonstrated correctly, as well as receive reinforcement for correct use of strategies and error correction for incorrect use of strategies (Mrachko & Kaczmarek, 2017) Therefore, it would be pragmatic to allocate resources toward more effective approaches to paraprofessional development. More direct coaching of paraprofessionals is needed in the preschool classroom, with opportunities to practice newly learned skills and receive feedback from a trained professional, in order to produce a long-lasting impact on adult use of learned teaching strategies and subsequent child outcomes.

It is a priority for EI/ECSE programs to provide effective, efficient and cost-effective approaches to providing quality paraprofessional development on the use of evidence-based practices, such as naturalistic behavioral teaching strategies, in the preschool classroom. Learning how to balance efficiency with effectiveness remains a significant challenge in the provision of adequate EI/ECSE services. Nevertheless, the current lack of training among direct service providers cannot be ignored. The current study adds to the literature base that direct coaching is an effective method for paraprofessional development. As previously mentioned, more efficient paraprofessional development approaches, such as "train the trainer" to deliver direct coaching, should be explored, in an effort to provide the farthest-reaching effects and adequately serve a larger population of young children with DD.

Conclusion

The current study provides strong evidence for the effectiveness of coaching TAs to implement EMT on increases in their fidelity of implementation of EMT strategies, while interacting with two children during free play in the preschool classroom. It also demonstrates the positive effect of TA implementation of EMT strategies on student social communication skills, including with student dyads. There is little available research on paraprofessional development among TAs working in earlier childhood settings, including research on coaching paraprofessionals to implement social communication interventions in the preschool classroom. Also, no previous research has been conducted on coaching TAs to implement social communication interventions with more than one child at a time. Research in this area is valuable, since TAs are regularly working directly with children in the preschool classroom, and teaching social

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communication skills during daily activities in the natural environment helps children to generalize newly learned social communication skills. In addition, TAs are often working with small groups of children, rather than providing one-on-one instruction. Future research should examine the effectiveness of coaching TAs to use EMT strategies with small groups of children (i.e., 3 – 5 children). Future research should also examine the "active ingredients" of paraprofessional development and EMT, in addition to more efficient approaches for providing professional development, in an effort to provide adequate social communication interventions for preschool children with DD. Finally, future research should further examine the generalization of TA's use of EMT strategies to other settings, activities and materials, as well as the maintenance of TA's use EMT strategies over time once coaching has been removed.

INDIRECT PREFERENCE ASSESSMENT

Child Name: **Date:**

We are interested in learning more about what toys/activities the child most likes to engage with in the classroom to create teaching opportunities in which the child is highly motivated to learn.

Directions: Please write down at least 6 **<u>toys</u>** you think the child most prefers to play with based on your interactions with the student and observations in the classroom. Rank order from most preferred (1) to least preferred (8).

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Now, please write down at least 6 **<u>activities</u>** you think the child most prefers to play with based on your interactions with the student and observations in the classroom. Rank order from most preferred (1) to least preferred (8).

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Thank you!

PROTOCOL

A Language and Social Skills Assessment Program
for Children with Autism or Other Developmental Disabilities

VB-MAPP

*Verbal Behavior Milestones
Assessment and Placement Program*

This protocol belongs to:

Harry
_____
(child's name)

Mark L. Sundberg, Ph.D.
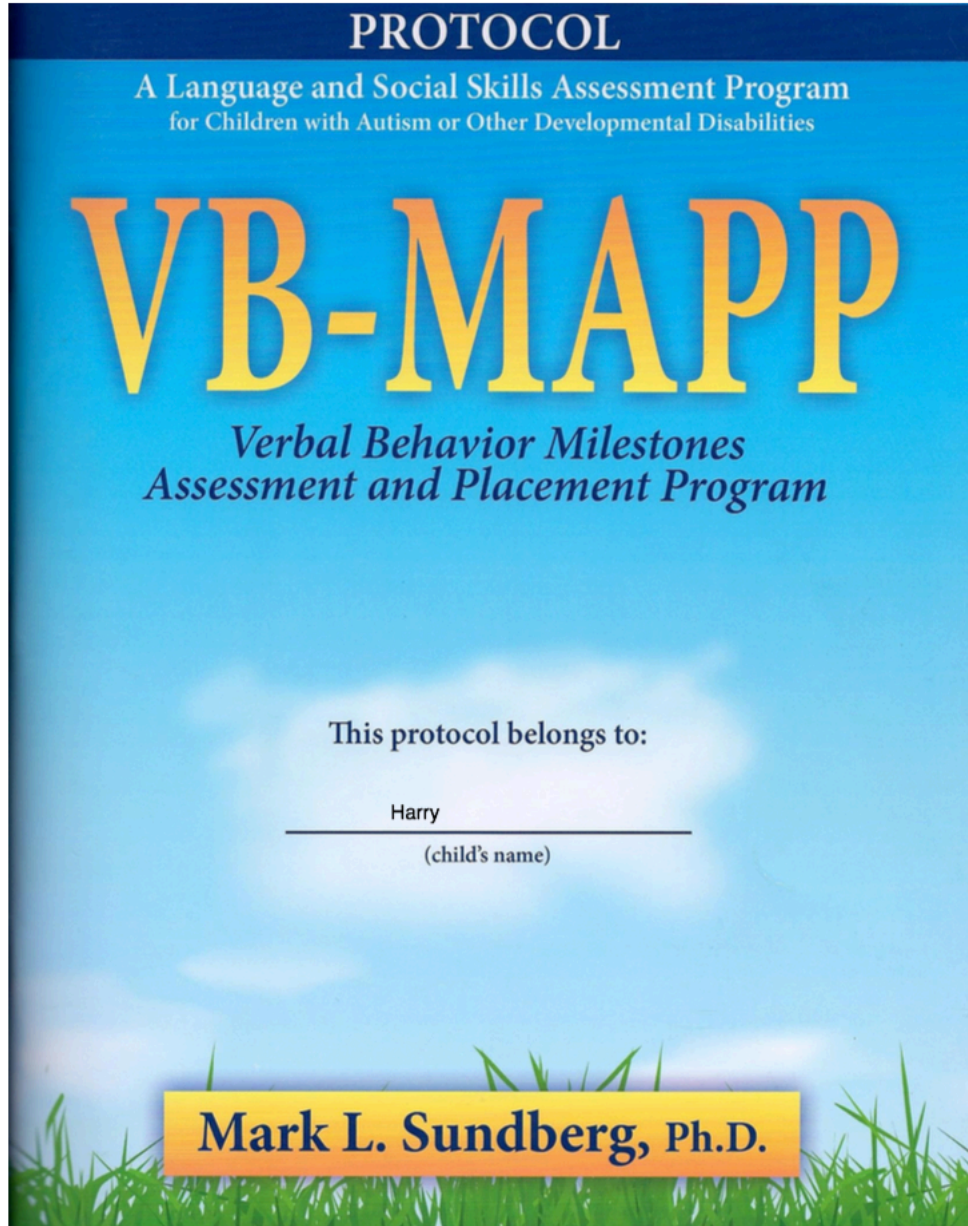
VB-MAPP

Verbal Behavior Milestones Assessment and Placement Program

This Protocol is designed to accompany the VB-MAPP Guide (Sundberg, 2008). The Guide contains the general instructions and scoring criteria for completing the VB-MAPP Protocol. The Guide also provides placement recommendations for each of the 170 milestones along with suggestions for IEP goals. In addition, the Guide contains a brief description of the basic components of a behavioral approach to language, and definitions and examples of the skills and barriers assessed in the VB-MAPP (i.e., mand, tact, intraverbal, scrolling). In order to gain the maximum benefit from the VB-MAPP, it is essential that the assessor use the VB-MAPP Guide. In addition, it is important that the assessor be familiar with behavior analysis, and a behavioral approach to language.

The VB-MAPP is based on B.F. Skinner's (1957) analysis of verbal behavior, developmental milestones, and field-test data from typically developing children, children with autism, and children with other developmental disabilities. Over the course of several years, speech pathologists, behavior analysts, psychologists, special education teachers, occupational therapists, and parents of children with special needs have provided additional input.

There are five components of the VB-MAPP[1]. The first part is the VB-MAPP Milestones Assessment, which constitutes the core of the program. It is designed to provide a representative sample of a child's existing verbal and related skills. The Milestones Assessment contains 170 measurable Milestones that are balanced across 16 skill areas, and 3 developmental levels (0-18 months, 18-30 months, and 30-48 months). The second part is the VB-MAPP Barriers Assessment, which provides an assessment of 24 learning and language acquisition barriers often faced by children with language delays. The third part is the VB-MAPP Transition Assessment, which provides an overall summary assessment of a child's readiness to move to a less restrictive educational setting. The fourth part is the VB-MAPP Task Analysis and Skills Tracking, which provides a further breakdown of the skills (the steps supporting the Milestones) and serves as a more thorough verbal behavior curriculum guide. There are approximately 900 skills in the task analysis that are developmentally balanced and sequenced, and presented in the form of checklists and charts for skill tracking.

The final component of the overall program is the VB-MAPP Placement and IEP Goals, which is not contained in this Protocol, but is contained in the VB-MAPP Guide. Once a child's skills and barriers have been identified and analyzed, IEP goals can be written and an intervention program can be designed and implemented to meet those goals. Supplemental materials for the VB-MAPP can be found at www.avbpress.com.

References

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
Sundberg, M. L. (2008). *The verbal behavior milestones assessment and placement program: The VB-MAPP guide*. Concord, CA: AVB Press.

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[1] For ease of reading, the male gender is used as a pronoun for the child being assessed throughout the VB-MAPP, and sign language can be used as a substitute for speech in all sections.

VB-MAPP Milestones Master Scoring Form

Child's name:				
Date of birth:				
Age at testing:	**1**	**2**	**3**	**4**

Key:	Score	Date	Color	Tester
1st TEST:				
2nd TEST:				
3rd TEST:				
4th TEST:				

LEVEL 3

	Mand	Tact	Listener	VP/MTS	Play	Social	Reading	Writing	LRFFC	IV	Group	Linguistics	Math
15													
14													
13													
12													
11													

LEVEL 2

	Mand	Tact	Listener	VP/MTS	Play	Social	Imitation	Echoic	LRFFC	IV	Group	Linguistics
10												
9												
8												
7												
6												

LEVEL 1

	Mand	Tact	Listener	VP/MTS	Play	Social	Imitation	Echoic	Vocal
5									
4									
3									
2									
1									

Milestones Assessment: LEVEL 1 (0-18 MONTHS)

(T) = Direct testing;   (O) = Observation;   (E) = Either testing or observation;   (TO) = Timed observation

MAND

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child use words, signs, or pictures to ask for desired items or activities?

1ST	2ND	3RD	4TH	
				1. Emits 2 words, signs, or PECS, but may require echoic, imitative, or other prompts, but no physical prompts (e.g., *cracker, book*) (E)
				2. Emits 4 different mands without prompts (except *What do you want?*) — the desired item can be present (e.g., *music, slinky, ball*) (T)
				3. Generalizes 6 mands across 2 people, 2 settings, and 2 different examples of a reinforcer (e.g., mands *bubbles* from mom and dad, inside and outside, a red bottle and a blue bottle) (E)
				4. Spontaneously emits (no verbal prompts) 5 mands — the desired item can be present (TO: 60 min.)
				5. Emits 10 different mands without prompts (except, *What do you want?*) — the desired item can be present (e.g., *apple, swing, car, juice*) (E)

Comments/notes:

TACT

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child tact people, objects, body parts, or pictures?

1ST	2ND	3RD	4TH	
				1. Tacts 2 items (e.g., people, pets, characters, or favorite objects) (T)
				2. Tacts any 4 items (e.g., people, pets, characters, or other objects) (T)
				3. Tacts 6 non-reinforcing items (e.g., *shoe, hat, spoon, car, cup, bed*) (T)
				4. Spontaneously tacts (no verbal prompts) 2 different items (TO: 60 min.)
				5. Tacts 10 items (e.g., common objects, people, body parts, or pictures) (T)

Comments/notes:

Milestones Assessment: Level 1 (0-18 months)

(T) = Direct testing; (O) = Observation; (E) = Either testing or observation; (TO) = Timed observation

INDEPENDENT PLAY

TOTAL SCORE:

ASSESSMENT			
1ST	2ND	3RD	4TH

Does the child engage in independent play behavior that is automatically reinforcing?

1ST	2ND	3RD	4TH

1. Manipulates and explores objects for 1 minute (e.g., looks at a toy, turns it over, presses buttons) (TO: 30 min.)

1ST	2ND	3RD	4TH

2. Shows variation in play by independently interacting with 5 different items (e.g., plays with rings, then a ball, then a block) (TO: 30 min.)

1ST	2ND	3RD	4TH

3. Demonstrates generalization by engaging in exploratory movement and playing with the toys in a novel environment for 2 minutes (e.g., in a new playroom) (TO: 30 min.)

1ST	2ND	3RD	4TH

4. Independently engages in movement play for 2 minutes (e.g., swinging, dancing, rocking, jumping, climbing) (TO: 30 min.)

1ST	2ND	3RD	4TH

5. Independently engages in cause-and-effect play for 2 minutes (e.g., dumping containers, playing with pop-up toys, pulling toys, etc.) (TO: 30 min.)

Comments/notes:

SOCIAL BEHAVIOR AND SOCIAL PLAY

TOTAL SCORE:

ASSESSMENT			
1ST	2ND	3RD	4TH

Does the child attend to others and attempt to socially engage others?

1ST	2ND	3RD	4TH

1. Makes eye contact as a type of mand 5 times (TO: 30 min.)

1ST	2ND	3RD	4TH

2. Indicates that he wants to be held or physically played with 2 times (e.g., climbs up on his mom's lap) (TO: 60 min.)

1ST	2ND	3RD	4TH

3. Spontaneously makes eye contact with other children 5 times (TO: 30 min.)

1ST	2ND	3RD	4TH

4. Spontaneously engages in parallel play near other children for a total of 2 minutes (e.g., sits in the sandbox near other children) (TO: 30 min.)

1ST	2ND	3RD	4TH

5. Spontaneously follows peers or imitates their motor behavior 2 times (e.g., follows a peer into a playhouse) (TO: 30 min.)

Comments/notes:

(T) = Direct testing; (O) = Observation; (E) = Either testing or observation; (TO) = Timed observation

INDEPENDENT PLAY

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child engage in independent play behavior that is automatically reinforcing?

1ST	2ND	3RD	4TH	
				6. Searches for a missing or corresponding toy or part of a set for 5 items or sets (e.g., a puzzle piece, a ball for a drop-in toy, a bottle for a baby doll) **(E)**
				7. Independently demonstrates the use of toys or objects according to their function for 5 items (e.g., placing a train on a track, pulling a wagon, holding a telephone to the ear) **(O)**
				8. Plays with everyday items in creative ways 2 times (e.g., uses a bowl as a drum or a box as an imaginary car) **(O)**
				9. Independently engages in play on structures and playground equipment for a total of 5 minutes (e.g., going down a slide, swinging) **(TO: 30 min.)**
				10. Assembles toys that have multiple parts for 5 different sets of materials (e.g., Mr. Potato Head, Little People sets, Cooties bugs, Kid K' Nex) **(O)**

Comments/notes:

SOCIAL BEHAVIOR AND SOCIAL PLAY

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child spontaneously participate in activities with other children and spontaneously verbally interact with them?

1ST	2ND	3RD	4TH	
				6. Initiates a physical interaction with a peer 2 times (e.g., a push in a wagon, hand holding, Ring Around the Rosy) **(TO: 30 min.)**
				7. Spontaneously mands to peers 5 times (e.g., *My turn. Push me. Look! Come on.*) **(TO: 60 min.)**
				8. Engages in sustained social play with peers for 3 minutes without adult prompts or reinforcement (e.g., cooperatively setting up a play set, water play) **(TO: 30 min.)**
				9. Spontaneously responds to the mands from peers 5 times (e.g., *Pull me in the wagon. I want the train.*) **(E)**
				10. Spontaneously mands to peers to participate in games, social play, etc., 2 times (e.g., *Come on you guys. Let's dig a hole.*) **(TO: 60 min.)**

Comments/notes:

(T) = Direct testing;   (O) = Observation;   (E) = Either testing or observation;   (TO) = Timed observation

MAND

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child demonstrate frequent and spontaneous manding primarily controlled by motivation (MOs)?

1ST	2ND	3RD	4TH	
				6. Mands for 20 different missing items without prompts (except, e.g., *What do you need?*) (e.g., mands for paper when given a crayon) **(E)**
				7. Mands for others to emit 5 different actions or missing actions needed to enjoy a desired activity (e.g., *open* to get outside, *push* when on a swing) **(E)**
				8. Emits 5 different mands that contain 2 or more words (not including, *I want*) (e.g., *Go fast. My turn. Pour juice.*) **(TO: 60 min.)**
				9. Spontaneously emits 15 different mands (e.g., *Let's play. Open. I want book.*) **(TO: 30 min.)**
				10. Emits 10 new mands without specific training (e.g., spontaneously says *Where kitty go?* without formal mand training) **(O)**

Comments/notes:

TACT

TOTAL SCORE:

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child tact nouns and verbs?

1ST	2ND	3RD	4TH	
				6. Tacts 25 items when asked, *What's that?* (e.g., *book, shoe, car, dog, hat*) **(T)**
				7. Generalizes tacts across 3 examples of 50 items, tested or from a list of known generalizations (e.g., tacts 3 different cars) **(T)**
				8. Tacts 10 actions when asked, for example, *What am I doing?* (e.g., *jumping, sleeping, eating*) **(T)**
				9. Tacts 50 two-component verb-noun or noun-verb combinations, tested or from a list of known two-component tacts (e.g., *washing face, Joe swinging, baby sleeping*) **(T)**
				10. Tacts a total of 200 nouns and/or verbs (or other parts of speech), tested or from an accumulated list of known tacts **(T)**

Comments/notes:

(T) = Direct testing;   (O) = Observation;   (E) = Either testing or observation;   (TO) = Timed observation

MAND   **TOTAL SCORE:**

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child mand for information, mand with different parts of speech, and give directions to others?

1ST	2ND	3RD	4TH	
				11. Spontaneously mands for different verbal information using a WH question word 5 times (e.g., *What's your name? Where do I go?*) **(TO: 60 min.)**
				12. Politely mands to stop an undesirable activity, or remove any aversive MO under 5 different circumstances (e.g., *Please stop pushing me. No thank you. Excuse me, can you move?*) **(E)**
				13. Mands with 10 different adjectives, prepositions, or adverbs (e.g., *My crayon is broken. Don't take it out. Go fast.*) **(TO: 60 min.)**
				14. Gives directions, instructions, or explanations as to how to do something or how to participate in an activity 5 times (e.g., *You put the glue on first, then stick it. You sit here while I get a book.*) **(O)**
				15. Mands for others to attend to his own intraverbal behavior 5 times (e.g., *Listen to me... I'll tell you... Here's what happened... I'm telling the story...*) **(O)**

Comments/notes:

TACT   **TOTAL SCORE:**

	ASSESSMENT		
1ST	2ND	3RD	4TH

Does the child emit a wide variety of tacts, and do they contain several different parts of speech?

1ST	2ND	3RD	4TH	
				11. Tacts the color, shape, and function of 5 objects (15 trials) when each object and question is presented in a mixed order (e.g., *What color is the refrigerator? What shape is the valentine? What do you do with the ball?*) (This is part tact and part intraverbal.) **(T)**
				12. Tacts 4 different prepositions (e.g., *in, out, on, under*) and 4 pronouns (e.g., *I, you, me, mine*) **(E)**
				13. Tacts 4 different adjectives, excluding colors and shapes (e.g., *big, little, long, short*) and 4 adverbs (e.g., *fast, slow, quietly, gently*) **(E)**
				14. Tacts with complete sentences containing 4 or more words, 20 times **(E)**
				15. Has a tact vocabulary of 1000 words (nouns, verbs, adjectives, etc.), tested or from an accumulated list of known tacts **(T)**

Comments/notes:

Milestones Assessment: LEVEL 3 (30-48 MONTHS)

(T) = Direct testing;   **(O)** = Observation;   **(E)** = Either testing or observation;   **(TO)** = Timed observation

INDEPENDENT PLAY

TOTAL SCORE:

ASSESSMENT			
1ST	2ND	3RD	4TH

Does the child spontaneously engage in independent play that is automatically reinforcing?

1ST	2ND	3RD	4TH	
				11. Spontaneously engages in pretend or imaginary play on 5 occasions (e.g., dressing up, a pretend party with stuffed animals, pretends to cook) **(O)**
				12. Repeats a gross motor behavior to obtain a better effect for 2 activities (e.g., throwing a ball in a basket, swinging a bat at a T-ball, foot stomping to launch a rocket, pumping a swing) **(O)**
				13. Independently engages in arts and crafts type activities for 5 minutes (e.g., drawing, coloring, painting, cutting, pasting) **(O)**
				14. Independently engages in sustained play activities for 10 minutes without adult prompts or reinforcement (e.g., playing with an Etch-a-sketch, playing dress-up) **(O)**
				15. Independently draws or writes in pre-academic activity books for 5 minutes (e.g., dot-to-dot, matching games, mazes, tracing letters and numbers) **(O)**

Comments/notes:

SOCIAL BEHAVIOR AND SOCIAL PLAY

TOTAL SCORE:

ASSESSMENT			
1ST	2ND	3RD	4TH

Does the child spontaneously engage in play and reciprocal verbal interactions with peers?

1ST	2ND	3RD	4TH	
				11. Spontaneously cooperates with a peer to accomplish a specific outcome 5 times (e.g., one child holds a bucket while the other pours in water) **(E)**
				12. Spontaneously mands to peers with a WH question 5 times (e.g., *Where are you going? What's that? Who are you being?*) **(TO: 60 min.)**
				13. Intraverbally responds to 5 different questions or statements from peers (e.g., verbally responds to *What do you want to play?*) **(E)**
				14. Engages in pretend social play activities with peers for 5 minutes without adult prompts (e.g., dress up play, acting out videos, playing house) **(O)**
				15. Engages in 4 verbal exchanges on 1 topic with peers for 5 topics (e.g., the children go back and forth talking about making a creek in a sandbox) **(O)**

Comments/notes:

MacArthur-Bates Communicative Development Inventory-III CDI

Child's name: _____   Birthdate: _____   Gender: _____

Person completing form (relationship to child): _____   Today's date: _____

VOCABULARY CHECKLIST

Children understand many more words than they say. We are particularly interested in the words your child SAYS. Please mark the words you have heard your child use. If your child uses a different pronunciation of a word, mark it anyway. This is only a sample of words; your child may know many other words not on this list.

○ dinosaur	○ glass	○ catch	○ peculiar
○ donkey	○ jar	○ drop	○ before
○ reindeer	○ ladder	○ fasten	○ then
○ castle	○ material	○ forget/forgot	○ today
○ drum	○ stamp	○ hate	○ week
○ football	○ tire	○ hurry	○ yesterday
○ microscope	○ furniture	○ leave	○ their
○ tricycle	○ kitchen	○ measure	○ they
○ kite	○ sofa/couch	○ peel	○ those
○ wagon	○ cloud	○ promise	○ yourself
○ lemon	○ fence	○ skate	○ why
○ peanut	○ hose	○ sneeze	○ about
○ cracker	○ sidewalk	○ somersault	○ above
○ salt	○ zoo	○ think	○ away
○ sauce	○ child	○ black	○ between
○ vanilla	○ cowboy	○ bored	○ on top of
○ vegetable	○ family	○ deep	○ each
○ beads	○ farmer	○ different	○ every
○ jeans	○ nobody	○ empty	○ none
○ elbow	○ nurse	○ expensive	○ might
○ (finger)nail	○ accident	○ fine	○ need to
○ thumb	○ circle	○ half	○ were
○ bandaid/bandage	○ front	○ long	○ although
○ blade	○ idea	○ lost	○ because
○ computer	○ camping	○ angry	○ however

Has your child begun to combine words yet, such as "'nother cookie" or "doggie bite?"

○ Not Yet	○ Sometimes	○ Often

If you answered "Not Yet," please stop here. If "Sometimes" or "Often," please turn the page.

Sentences

For each pair of sentences below, mark the one that sounds MOST like the way your child talks at the moment. If your child is saying sentences even more complicated than the two provided, mark the second one.

(Talking about something that already happened)

1. ○ Daddy pick me up.	5. ○ Don't read book.	9. ○ I want truck.
○ Daddy picked me up.	○ Don't want you read that book.	○ I want truck like Tommie has.
2. ○ That my truck.	6. ○ Why he run away?	10. ○ This dolly big.
○ That's my truck.	○ Why did he run away?	○ This dolly big and this dolly little.
3. ○ Coffee hot.	7. ○ He did it.	11. ○ This pig have a broken leg.
○ That coffee hot.	○ I know who did it.	○ This pig have a broken leg but kitty don't.
4. ○ I like read stories.	8. ○ We got to go now.	12. ○ It got broken.
○ I like to read stories.	○ I think we got to go now.	○ It got broken by the car.

Using Language

	YES	NO
1. Does your child understand the concept of "one"? If you ask for just one (cookie, strawberry, etc.) will your child give you only one and then stop?	○	○
2. Does your child ask questions with more than one word that begin "what" or "where"?	○	○
3. Does your child ask questions with more than one word that begin "why" or "how"?	○	○
4. Does your child give reasons for things, using the word "because"?	○	○
5. If you asked your child "What is a horse?", could he answer "an animal"?	○	○
6. Can your child name simple shapes with the words "circle," "square," and "triangle"?	○	○
7. Does your child talk about things that "could" or "might" happen, such as "he could hurt himself if he's not careful"?	○	○
8. Does your child ever ask what a particular word means?	○	○
9. Could your child tell you which of two objects is larger if they were not present—for example, "which is bigger, a horse or a dog"?	○	○
10. Does your child know his/her right hand from his/her left hand?	○	○
11. Does your child use "-est" words such as "biggest" and "strongest"?	○	○
12. Can your child answer questions such as "what do you do when you are hungry?" and "what do you when you are tired?" with appropriate answers such as "get food," "eat," "go to sleep," and/or "take a nap"?	○	○

Examples: Please list three of the longest sentences you have heard your child say recently.

1. _____

2. _____

3. _____

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APPENDIX D

EXAMPLE LANGUAGE SAMPLE

Date and Location: _____
Child Initials: _____
*Start time:*_____
*End time:*_____

Start Time	Utterance	Approx-imation to known words?	Verbal Request?	Prompted?	Meet target word length?
:56	I did it	0	0	X	X
1:02	Yeah	0	0	X	X
1: 17	Buppee hop	0	0	X	X
1:44	Wow	0	0	X	X
1:45	Ta da	0	0	X	X
3:43	Whoa	0	0	X	X
4:05	Whoa	0	0	X	X
5:10	Jump	0	0	X	X
5:34	Up	0	0	X	X
5:49	Ta da	0	0	X	X
6:03	Ah be be	0	0	X	X
6:15	Ah be	0	0	X	X
6:25	Bubbee (bunny)	1	1	1	0
8:03	Yeah	0	0	X	X
8:16	Strawbah (strawberry)	0	1	1	0
8:21	Bah (ball)	1	1	0	0
8:43	Ball	0	1	1	1
9:15	Ah see wah	0	0	X	X
9:44	Ball	0	0	X	X
9:52	Mommy	0	0	X	X
10:44	Beh yah	0	0	X	X
11:32	hop	0	0	X	X
11:57	Wah be	0	0	X	X
12:44	Mommy	0	0	X	X
12:54	Dah deet	0	0	X	X
13:57	Wait	0	0	0	1
13:58	Yes	0	0	X	X
14:00	Where go?	0	1	0	1
14:35	fish	0	1	1	1

APPENDIX E

FIDELITY CHECKLIST FOR TEACHING ASSISTANTS

Observer: _____   P   R   Date: _____

Session Number: _____B   I   Start Time: _____ Stop Time: _____

Strategy: Follows child's lead		
Engages with same activities/or materials as students (at least one student at a time if engaged with different activities/materials)	Y	N
Stays at students' eye level and face to face 90% of the time	Y	N
Gives less than three play related directions per session per student (e.g., let's play with the barn) and asks less than three wh-questions per session per student (e.g., who, what, where, why) except for providing a choice or asking "what do you want?"	Y	N

Strategy: Notice and Respond and Balanced Turn Taking			
Notices and responds to students' communication attempts at least 75% of the time for both students within three seconds.	Y	N	NA
Verbally prompts child initiations and or responses to peers	Y	N	NA

Facilitates turn taking between peers during play using verbal prompts or visual prompts (e.g., timer)	Y	N	NA

Strategy: Mirror and Map			
Imitates students' words within 3 seconds of vocalization (at least three times per student). (Mark Y if student vocalizes less than 5 times but TA imitates every vocalization). (Mark NA if neither student vocalizes)	Y	N	NA
Imitates students' actions within 3 seconds of action (at least 3 times per student)	Y	N	
Labels students' actions (at least 3 times per student)	Y	N	

Expand and Model Language and Play			
Expands on students' communication attempts by adding words within 3 seconds of child communication (at least 3 times per student). Communication attempts may include gestures. If student has less than three communication attempts but TA expands every time, mark Y. If no communication attempts mark NA.	Y	N	NA
Models a new symbolic play action with a toy (at least 3 times per student). This can be directed towards both student at same time.	Y	N	

Environmental Arrangement		

Uses at least 2 of the following with both students (i.e., 2 strategies per student):
     -In sight but out of reach
     -Pausing within routine
     -Inadequate Portions
     -Sabotage
     -Use of peer to withhold items
Strategies may be used with an individual child at a time or directed toward both children at the same time.
	Y N	

Frequency of environmental arrangement strategies (count any of the strategies listed above)	Student 1: _____	Student 2: _____

Prompting		
TA uses least to most prompting hierarchy correctly. Only mark Y if entire sequence is correct. 1. Gains child's attention. 2. 3 second time delay 3. Provides choice 4. Provides say prompt 5. Provides object/action using target words or expanding on students' words	Y N NA	
Frequency of prompting episodes. (Only count if entire sequence is correct.)	Student 1: _____	Student 2: _____
Provides desired item/activity for correct responding within 3 seconds.	Y N NA	
Number observed _____ /_____ possible Treatment Fidelity =_____%		

TARGET STUDENT BEHAVIOR

Frequency Data

Target student: _____
Date: _____
Observer: _____ **P R**

Directions: Tally each occurrence of the following behavior: prompted verbal request, unprompted verbal request, prompted verbal request meeting target length of words, and unprompted target verbal requests meeting target length of words.

Target length of words: _____

	Prompted verbal requests	**Unprompted verbal requests**	**Prompted verbal requests meeting target length of words**	**Unprompted verbal requests meeting target length of words**
Tally				
Total per session				

APPENDIX G

PROCEDURAL FIDELITY

Date: _____

TA: _____

Observer: _____ **P R**

Coaching Procedures			
Coach reviews task analysis with TA prior to practicing.	Y	N	
Coach gives TA 15 minutes to practice using strategies.	Y	N	
Coach points out opportunities to use a strategy.	Y	N	
Coach waits for the TA to use the strategy correctly.	Y	N	
If the TA does not use the strategy correctly, coach provides error correction.	Y	N	NA
If the TA is still unable to use the strategy correctly after 3 opportunities, coach models the use of the strategy.	Y	N	NA
Coach provides the TA with descriptive verbal praise at least 8 times throughout the 15 minute the session.	Y	N	
Coach provides verbal feedback at the end of the 15-minute session.	Y	N	
Coach gives TA opportunity to ask questions after practicing.	Y	N	
Number observed _____ / _____ possible Procedural Fidelity = _____%			

SOCIAL VALIDITY QUESTIONNAIRE TEACHING ASSISTANTS

Self-Evaluation: Evaluation, Monitoring, and Maintenance
Social Validity

Please score the following items by circling the number that best indicates how you feel about the Naturalistic Behavioral Intervention?

1. How acceptable did you find the naturalistic behavioral intervention?

1	2	3	4	5
Not at all acceptable		Neutral		Very acceptable

2. How willing are you to carry out the naturalistic behavioral teaching strategies?

1	2	3	4	5
Not at all willing		Neutral		Very willing

3. How much time was needed each day for you to carry out the naturalistic behavioral teaching strategies?

1	2	3	4	5
Little time was needed		Neutral		Much time was needed

4. How confident are you that the naturalistic behavioral intervention is effective for children in your classroom?

1	2	3	4	5
Not at all confident		Neutral		Very confident

5. How likely is it that using the naturalistic behavioral teaching strategies will make permanent improvements in the social communication skills of children in your classroom?

1	2	3	4	5
Unlikely		Neutral		Very likely

6. How disruptive was it to carry out the naturalistic behavioral intervention in the classroom?

1	2	3	4	5

Not at all disruptive   Neutral   Very disruptive

7. How much do you like the procedures used in this intervention?

1	2	3	4	5
Do not like them at all		Neutral		Like them very much

8. To what extent did you notice undesirable side-effects from this intervention?

1	2	3	4	5
No side-effects		Neutral		Many side-effects

9. How much discomfort did children in your classroom experience during this intervention?

1	2	3	4	5
No discomfort at all		Neutral		Very much

10. How willing are you to change your routines to continue to carry out this intervention in the classroom?

1	2	3	4	5
Not at all		Neutral		Very willing

11. How well did carrying out the intervention fit into your existing classroom routine?

1	2	3	4	5
Not at all well		Neutral		Very well

12. How well did the goal of the intervention fit with your professional goals?

1	2	3	4	5
Not at all		Neutral		Very much

13. Did you learn valuable strategies from participating in this intervention that you were not already using?

1	2	3	4	5
Not at all valuable		Neutral		Very valuable

APPENDIX I

SOCIAL VALIDITY QUESTIONNAIRE LEAD TEACHERS

Self-Evaluation: Evaluation, Monitoring, and Maintenance
Social Validity

Please score the following items by circling the number that best indicates how you feel about the Naturalistic Behavioral Intervention?

1. How acceptable did you find the naturalistic behavioral intervention?

1	2	3	4	5
Not at all acceptable		Neutral		Very acceptable

2. How willing are you to have your teaching assistant carry out the naturalistic behavioral teaching strategies in the future?

1	2	3	4	5
Not at all willing		Neutral		Very willing

3. How much time was needed each day for your teaching assistant to carry out the naturalistic behavioral teaching strategies?

1	2	3	4	5
Little time was needed		Neutral		Much time was needed

4. How confident are you that the naturalistic behavioral intervention was effective for children in your classroom?

1	2	3	4	5
Not at all confident		Neutral		Very confident

5. How likely is it that using the naturalistic behavioral teaching strategies made permanent improvements in the social communication skills of children in your classroom?

1	2	3	4	5
Unlikely		Neutral		Very likely

6. How disruptive was it for your teaching assistant carry out the naturalistic behavioral intervention in the classroom?

1	2	3	4	5
Not at all disruptive		Neutral		Very disruptive

7. To what extent did you notice undesirable side-effects from this intervention?

1	2	3	4	5
No side-effects likely		Neutral		Many side-effects likely

8. How much discomfort did children in your classroom experience during this intervention?

1	2	3	4	5
No discomfort at all		Neutral		Very much discomfort

9. How willing are you to change your routines to continue to carry out this intervention in the classroom?

1	2	3	4	5
Not at all		Neutral		Very willing

10. How well did the the intervention fit into your existing classroom routine?

1	2	3	4	5
Not at all well		Neutral		Very well

11. How well did the goals of the intervention fit with your classroom goals?

1	2	3	4	5
Not at all		Neutral		Very much

12. Did teaching assistants learn valuable strategies from participating in this intervention that they were not already using?

1	2	3	4	5
Not at all likely		Neutral		Very likely

TASK ANALYSIS

**Naturalistic Behavioral Intervention
Task Analysis**

---

1. <u>Follow</u> their lead!

2. <u>Notice and Respond</u> to all communication attempts

3. <u>Mirror and Map</u> (imitate and label) actions and words

4. <u>Model and Expand</u> language and play

5. <u>Arrange the Environment</u>

   - In sight but out of reach

   - Sabotage

   - Pause within a routine

   - Inadequate portions

   - Use peer to control items

6. <u>Prompt</u> social communication

   1. Gain attention

   2. Wait 3 seconds

   3. Provide a choice

   4. Wait 3 seconds

   5. Provide a "say" prompt

   6. Provide access

APPENDIX K

ACTIVITY MATRIX

Teaching Language During Play
Activity Matrix

Student: _____

Toys/Activities	Target Words/Phrases	Strategies
Ball maze	*I want ball*	*Inadequate portions (only give one ball)* *In sight but out of reach (put balls in clear container that is hard to open)* *Time delay (hold ball and look expectantly and wait)*

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