

PIVOTAL PLAY: PEER MEDIATED JOINT ATTENTION INTERVENTION

by

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## DISSERTATION ABSTRACT

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Title: Pivotal Play: Peer-mediated Joint Attention Intervention

Inclusive preschool settings often provide meaningful social and play opportunities with same aged peers for children with special needs. Targeted interventions, however, may be required to maximize opportunities inherent in rich classroom environments. Children with autism spectrum disorders (ASD) are especially at risk for isolation from peers in inclusive preschool settings and have benefited from a range of social communication interventions. In particular, peer mediated interventions hold interest for social communication interventions for children with ASD because of their ability to teach skills that are socially valid. One pivotal skill for social interactions, joint attention, has been examined primarily in clinical settings. Additional research is needed on joint attention within natural settings and with naturally occurring partners such as parents or peers.

The proposed research extends previous findings from a piloted parent-mediated joint attention intervention and applies joint attention interventions to a peer-mediated setting. This joint attention study used individual concurrent multiple baseline design across child-peer dyads in inclusive preschool classrooms to evaluate the effects of the intervention on increased response to joint attention behaviors to interventionist bids; on

increased bids from peers to target children with ASD; and on increased response to joint attention behaviors to peer bids. Elements of discrete trial training (DTT) and naturalistic instruction were used to teach response to joint attention behaviors to young children with ASD using both interventionists and same-aged peers.

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## CHAPTER I

### INTRODUCTION

A large and growing body of literature indicates the critical importance of quality early childhood education (Arteaga, Humpage, Reynolds & Temple, 2014; Barnett & Hustedt, 2003; Heckman, 2011). Evidence suggests that consistent and enriching early childhood education opportunities correlate with later life gains including academic achievement (e.g., Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002), health (e.g., Reynolds et al., 2007), and mitigation of risk factors (Ramey, Campbell, & Burchinal, 2000). Research clearly documents diverse benefits of early childhood education experiences (e.g., Reynolds et al., 2007) including opportunities to develop social communication skills (McClelland, Morrison, & Holmes, 2000; Craig-Unkefer & Kaiser, 2002). Early and positive social communication opportunities with same-aged peers, both structured and during play, are critical benefits of preschool experiences (Ginsburg, 2007; Coolahan, Funtuzzo, Mendez & McDermott, 2000).

For children with special needs, these early social opportunities are even more critical (Macy & Bricker, 2007; Odom & Diamond, 1998). In fact, interest in providing valuable social opportunities with same-aged peers propels the rationale for inclusive education and educating children with special needs in the least restrictive environment (Odom, Buysse, & Soukakou, 2011; Dunlap, Barton, Smith, & Yeung, 2015). Time spent in classrooms with typically developing peers allows for children with special needs to have more opportunities to practice emergent social communication skills (Harjusola-Webb, Hubbell, Bedesem, 2012). Furthermore, same aged peers provide ready models for other skills important during the preschool years including play and adaptive skills



(Zhang & Wheeler, 2011). However, without targeted intervention, children with special needs may not receive maximal benefits in inclusive early childhood settings (Muccio, Kidd, White & Burns, 2013). For example, targeted social communication intervention is often needed to reduce isolation from typically developing peers in inclusive settings (Gerber, Brice, Capone, Fujiki, & Timler, 2012). Fortunately, there is a substantial research base related to supporting social communication growth in young children with special needs, even in the inclusive preschool classroom (Kennedy & Pigott, 2012; Whalon, Conroy, Martinez, & Werch, 2015).

Children with autism spectrum disorders (ASD) are at particular risk for isolation from their peers. ASD is defined in part by deficits in social communication, including both functional and social-pragmatic communication development that limit peer interactions (2013, American Psychiatric Association). Even given opportunities in the same early childhood setting, these deficits, along with rigid and repetitive behaviors and interests and often co-morbid challenging behavior, can serve as major barriers to meaningful interactions with same aged peers for children with ASD (Camargo, Rispoli, Ganz, & Hong, 2014). Intensive and targeted interventions for social communication skills are critical in order for young children with ASD to access the benefits of early childhood settings (Matson, Hess, Mahan, 2013; Mundy & Crawson, 1997). Fortunately, promising and evidence-based interventions exist to support children with ASD in social communication domains (Warren, McPheeters, Sathe, & Foss-Feig, 2011; Mesibov & Shea, 2011; Landa, 2007).

Increasing interest and research in inclusive settings has enriched the literature on social communication skills in natural settings (Simpson, de Boer-Ott, & Smith Myles,

2003). Additional research is being conducted in everyday, naturalistic contexts (e.g., preschool classroom; e.g., Stanton-Chapman & Snell, 2011, Dykstra, Boyd, Watson & Crais, 2011). For example, Lawton and Kasari (2012) showed the efficacy of a teacher training approach to increase joint attention and symbolic play skills in the preschool classroom. In another recent study, Goods et al. examined the effect of the Joint Attention Symbolic Play Engagement and Regulation (JA/SPER) intervention in the preschool context (2013). Yet, there is still a need for more research in these more applied settings so that skills learned in controlled environments can be generalized to everyday settings such as the preschool classroom or home. In a recent systematic review of social communication interventions, Hansen and colleagues (2014) found only a small body of literature--16 studies-- targeting interventions on social communication targets in inclusive preschool settings for children with ASD. Very few of these studies used peers as agents or embedded intervention directly into play. More research is needed on social communication interventions for young children with ASD in natural contexts in order to identify best practices for social communication intervention in inclusive settings.

Peer mediated intervention has been shown to be an effective and socially valid means for intervention for core deficits of ASD, such as play and social communication. Additionally, peer mediated intervention is especially relevant in inclusive settings where children with ASD regularly encounter typically developing peers (Zhang & Wheeler, 2011; Whalon, Conroy, Martinez, & Werch, 2015). Recent reviews have identified findings from peer-mediated interventions and interventions that directly involve peers ranging in age from early childhood to high school (e.g., Watkins, O'Reilly, Kuhn, Gevarter, Lancioni, Sigafos & Lang, 2015; Boudreau, Corkum, Meko, & Smith, 2015).

Further evidence is needed specifically on peer-mediated interventions for preschool-aged children to identify effective strategies for this unique setting and population.

One social communication deficit typical to individuals with ASD, although missing from the literature on peer-mediated intervention, is a failure to develop joint attention skills (Jones, Carr, & Feeley, 2006; Taylor & Hoch, 2008). Joint attention is the reciprocal and triadic focus of two individuals on an object. For example, a mother points out a bird in the tree to her child who then looks at the bird and back at the mother. In order to engage successfully in joint attention, the child must either make a bid for joint attention (e.g., pointing at something) or respond to a bid for joint attention (e.g., following someone else's point; Jones et al., 2006). Joint attention provides the foundation for more complex social behaviors such as perspective taking and back-and-forth social exchanges (Jones & Carr, 2004). Additional research has shown that joint attention may serve as a pivotal skill for additional developmental domains such as language and play (Charman, 2003). Research on joint attention skills for young children with autism is an emergent area of research in developmental psychology and special education (White et al., 2011; Sullivan, Mundy, Mastergeorge, 2015).

Much of the research on the development joint attention comes from a social cognitive perspective (e.g., Sullivan et al, 2015; Van Hecke, Mundy, & Mastergeorge, 2015). This theory situates a joint attention interaction as a foundational skill for later social perspective taking, such as theory of mind (Baron-Cohen, Lombardo, Tager-Flusberg, 2013). According to this theory of joint attention, in order for a child to understand the joint attention bid of their parent, they have to recognize that their parent is intending for them to look at the object and therefore are engaging in the earliest stages

of recognizing that others' thoughts are different than their own (Mundy, 2003). Consequently, many intervention studies situate this early perspective taking skill as a developmental component of parent-child reciprocity and target the skill in terms of increasing parent-child engagement (e.g., Rogers et al., 2012; Schertz, Odom & Baggett, 2013).

In order to intervene on distinct behavioral components of joint attention, a theory that recognizes the behavioral function of joint attention behaviors is important. The theory of change for the current intervention will use a behavior analytic perspective on joint attention intervention. Dube and colleagues (2004) conceptualize a model of joint attention that shows the discriminative stimuli and reinforcement present in a joint attention interaction. This model allows for interventions that target deficits in the entire joint attention behavior chain for children with ASD, and hinge on questions of reinforcement (Dube et al., 2004). While other interventions have certainly used behavioral principles (e.g., Taylor & Hoch, 2007; Jones, Carr, & Feeley, 2003), this intervention extends behavior analytic intervention on joint attention based specifically on this model by intervening on the entire behavior chain (i.e., a look towards an object and a look back at the peer) and by using peers to contrive motivating operations that may be absent otherwise. Figure 1 illustrates the theory of change for the current study. This theory of change supposes that by intervening on both target child response to joint attention skill and peer initiation of joint attention skills, target child response to joint attention in the peer context (i.e., classroom) will improve.

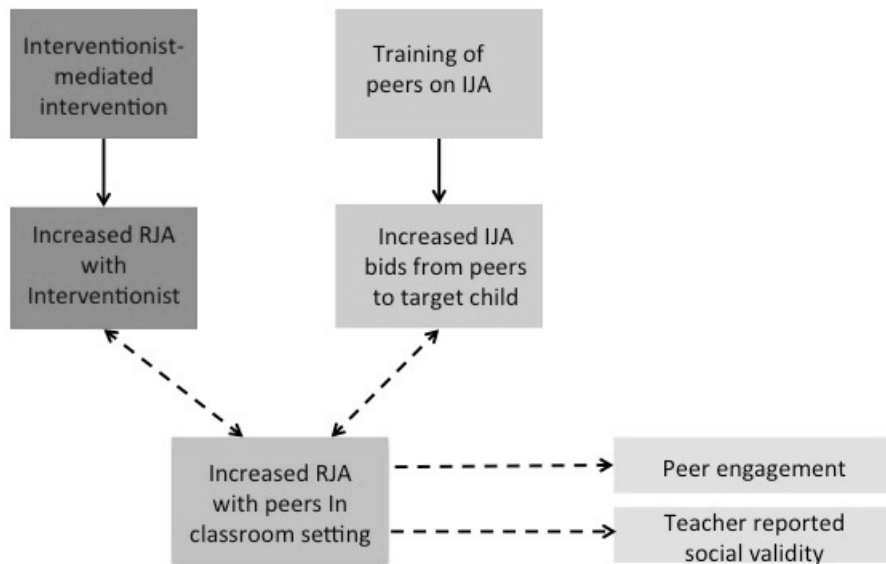


Figure 1. *Theory of Change for Pivotal Play Intervention*

Hansen and colleagues (*under review*) examined the effects of a parent training intervention on response to joint attention behaviors in young children (ages 3-6) with ASD. This pilot study consisted of a concurrent multiple-baseline design across four parent-child dyads and indicated positive effects of an intervention based in discrete trial training (DTT; i.e., prompting hierarchies) and naturalistic instruction (i.e., environmental arrangement, child-directed play, and descriptive praise). Results of this study showed parents were able to learn this intervention with fidelity, and that a parent implemented intervention increased child response to joint attention behaviors. Additionally, unprompted independent response to joint attention behavior increased (i.e., the parent did not need to prompt child behavior). This study took place in a clinic setting with specific materials arranged to easily elicit response to joint attention behaviors. Further research is needed to evaluate the success of this joint attention intervention in different settings and with different agents in order to evaluate the generalizability of this intervention. The proposed study extends these findings into a

more naturalistic environment, an inclusive preschool classroom, and with new agents, peers.

## CHAPTER II

### REVIEW OF THE LITERATURE

Interventions targeting social communication are critical for children with developmental disabilities due to potential barriers to learning from positive interactions and friendships with peers (Whalon, et al., 2015). Specifically, recent research has indicated that peer mediated interventions may be of particular interest for intervention on core deficits of ASD, especially social communication and play (Zhang and Wheeler, 2011; Wang, Cui, & Parrila, 2011). Peer mediated intervention refers to interventions wherein a peer serves as the agent for at least a portion of an intervention (Chan et al., 2009; Wang and Spillane, 2009) and may contain a range of other teaching strategies and interventions (Kashinath, 2012). Interventions using peers to teach target skills have been shown to be effective for a range of targets, including academics (e.g., Jimenez, Browder, & Spooner, 2012), social communication (e.g. Chan et al., 2009), and play (e.g. DiSalvo & Oswald, 2002) across the age range (Chan et al., 2009).

Although there is a large and growing body of research on peer mediated interventions (Chan et al., 2009; DiSalvo & Oswald, 2002) and an emergent body of research on peer-mediated literature specific to social communication intervention for children with ASD (e.g., Goldstien, Kaczmarak & Pennington, 1992), the body of literature on peer-mediated interventions in the preschool classroom is relatively small. Participation in preschool has been shown to provide early social communication gains, and inclusive preschool settings are meant to reduce barriers to those gains for children with disabilities (Rafferty, Piscitelli, Boettcher, 2003). Peers are uniquely able to model social communication skills that are age appropriate, socially relevant, and context

specific (Hansen et al., 2014; Locke, Rotheram-Fuller, & Kasari, 2012). Because peer behavior is less predictable and more varied than adult behavior, adult models of hypothetical child behavior can often cause overly scripted responding (Wang et al., 2011; Kasari et al., 2011). More research is needed on adaptations to peer-mediated interventions necessary for success in the preschool classroom. Specifically, adaptations are needed for younger-aged peers and for less structured environments (Chan et al., 2009).

Joint attention is a pivotal social communication skill often overlooked in preschool aged children, but frequently absent or impaired in young children with ASD (Lawton & Kasari, 2013; Key et al., 2014). Joint attention, or a triadic interaction featuring alternating attention between an object or event and another individual, is critical for skills like conversation and play, as well as later language learning (Sullivan, et al., 2015). In children who are typically developing, joint attention is foundational to early social communication interactions, and shared engagement with parents, caregivers, and peers. The existing body of research on joint attention is small, and typically investigates joint attention indirectly or within a highly controlled, systematic context. More research is needed on joint attention in natural settings and with naturally occurring partners such as parents, siblings, and peers (White et al., 2011).

Recent research supports peer-mediated intervention as a viable methodology for intervention on social communication targets for young children with ASD, and joint attention is an emergent topic in social communication interventions; however, there is little research combining these two topics. Some research has examined joint attention in the classroom context with teacher intervention (e.g. Lawton & Kasari, 2012) and in a



clinical context with parents or siblings serving as the agent (e.g., Ferraioli & Harris, 2011). A very limited number of studies have investigated peer-mediated interventions on joint attention (Barber, Saffo, Gilpin, & Craft, 2015; Pollard, Betz & Higbee, 2012).

Peer-mediated intervention is a natural choice for intervention on joint attention because it allows the skill to be taught by natural change agents within a natural setting.

Recent reviews have focused on peer-mediated intervention (e.g., Wang et al., 2011) including peer-mediated interventions specific to social communication skills in children with ASD (e.g., Schmidt & Stichter, 2012), and on peer involvement in social communication intervention (e.g., Chung, Carter, & Sisco, 2013). Despite recent systematic reviews on peer-mediated intervention, the literature specific to preschool has not been well-reviewed and best practices in adaptation of these interventions to a preschool setting and age range must be synthesized. Recent reviews have also been conducted on joint attention (White et al., 2011; Benson, 2015). Results of these reviews indicate that the extant body of literature on joint attention is relatively small. Authors of recent reviews on joint attention indicate the need for further systematic research in novel settings, as well as systematic definition and understanding of topographies of joint attention (e.g., Lawton & Kasari, 2013).

This chapter provides a review of the available literature, focusing on two main areas. First, a review of the literature on peer-mediated social-communication intervention for young children with ASD is summarized. Secondly, a review of intervention literature on joint attention, specifically for young children with ASD is presented. These two areas are summarized in order to illustrate a gap in these bodies of literature. Areas for future research and practice are discussed.

## **Review Methods**

Systematic searches of (a) available literature and (b) previously published reviews in these areas were completed. Searches were conducted using three databases: Academic Search Premier, ERIC and PsychINFO. For the literature on joint attention, the following search terms were completed in all possible combinations for each data base “joint attention” “early social skills” “autis\*” “autism spectrum disorder”, “Pervasive Developmental Disorder” and “intervention”. Additional searches were made using the terms “joint attention” “review” and “ joint attention” “literature review”. Articles were retained if they used an experimental (i.e., randomized control trial, single subject) research design to directly intervene on either response to or initiation of joint attention bids. Articles were not retained if they did not include a child with or at risk for an ASD, did not feature an intervention, or reported joint attention as a secondary variable.

For the literature on peer-mediated social communication, the same search procedures were used as in the previous search but for the following search terms: “social communication”, “social skills”, “preschool”, “early childhood”, “ peer-mediated”, “peers”, “peer coach\*”, “peer train\*”, “autis\*”, “autism spectrum disorder”, “Pervasive Developmental Disorder”. Additional searches were run for “peer”, “autis\*” and “review”. Articles were retained if they used an experimental or quasi-experimental research design to examine the effect of peers directly involved in a social communication intervention for a young child with ASD. Articles were excluded if the child was outside the age range of 2-8, if the peer was not a direct change agent of the

intervention, or if the intervention target was not focused on increasing social communication skills.

### **Review Results**

Results from this review indicated a small body of literature for each of the literature searches and a smaller still body of literature combining these two areas. The findings are summarized in terms of (a) participants and settings (b) interventions and strategies (c) results and efficacy and (d) implications for future research.

Table 1

*Reference, design, agent, setting, peer role, setting, intervention, target child characteristics, peer characteristics*

Reference	Study			Intervention	Peer Characteristics		
	Design	Peer role	Setting	Description	Age	Age	Selection criteria/ developmental level
Banda, Hart, Liu-Gitz (2010)	MBL across participants	Trained on specific social skills.	GE kindergarten classroom.	Peers pre-trained to initiate and respond appropriately to target child. Interventionist then trained target child.	6		No information given
Ganz & Flores (2008)	Changing criterion	Peers trained on scripts	Spare classroom at preschool	Visual strategies were used to teach scripted play scenarios in play with typically developing peers.	4	4-5	Between the ages of 4-5, have sentences of more than four words.
Gonzalez-Lopez & Kamps (1997)	Reversal	Children trained on strategies for play with target children	Special education classroom.	Play groups after direct instruction on strategies such as giving easy instructions, modeling and prompting, and praise.	5-7	5-8	Teacher selected.
Jung, Sainato, & Davis (2008)	Multiple baseline design across participants	Embedded peer modeling	Inclusive pre-kindergarten classroom	Peers trained to recognize and appropriately respond to bids from target children.	5-6	4-5	No developmental delays, follow directions consistently, demonstrated history of age-appropriate interactions with peers.
Kravits, Kamps, Kemmerer & Potucek, (2002)	MBL across settings	Peer training on engagement of target child in activities.	Home and classroom.	Parent and interventionist PECS intervention across settings, one of which was the classroom where typically developing peers were trained to engage, prompt, and train	6		No information given

				—	target child.			
Katz & Girolametto (2013)	MBL across participants	Participation with target child in social skill story-book reading and strategies for interaction.	Training in clinic room, generalization to free play in classrooms.		Teachers were trained to use social stories and other social communication intervention strategies. Interventionists then also trained target children and typically developing peers. Generalization data was taken in the classroom as supervised by teachers.	4-5	4-5	Teacher nominated peers. Criteria included typical language development, typical social skills (as reported anecdotally), and previous interest in interacting with the target child.
Kohler, Greteman, Raschke, & Highnam	MBL across play groups.	Peers made up three different play groups that met regularly.	Inclusive preschool classroom		Target child and peers participated in modified buddy skills training.	4	4	Good attendance, age appropriate play/social skills and high levels of compliance.
Laushey & Heflin (2000)	Reversal	Target children assigned daily buddies. Buddies rotated and served as play-partners during free time.	Preschool classroom.		Daily buddy intervention featuring direct peer-training worked to increase dependent variables of reciprocal requesting, appropriately getting the attention of others, waiting for their turn and looking at someone when they are talking to you.	5	5-6	Classmates
Nelson, Nelson, McDonnell, Johnston & Crompton (2007).	MBL across participants	Participants in keys to play intervention	Four different preschool programs: Headstarts, inclusive classroom and a community preschool.		Keys to play intervention was used classroom-wide and personalized for target participants.	3-4		Not reported
Thiemann & Goldstien,	MBL across behaviors	Social partners for videoed	Clinic room	—	Target children given pictorial cues and video-feedback for interactions with typically	6-12		No social communication difficulties, could provide good models, completed

(2001)		interventions.		—	developing peers.			enough work to allow for time away from classroom.
Thiemann-Bourque, Goldstien (2004)	MBL across participants and behaviors	Taught five social facilitative skills: look wait and listen, answer questions, keep talking, say something nice and start talking.	Inclusive elementary school classroom		Peer training as well as adult training on target skills using comic strips and visual cues.	7-9	7-9	Teacher recommendation of children in top 30% of sociometric ratings with age appropriate social communication skills and willingness to participate.

## **Peer-Mediated interventions in Preschool**

Results from the current review identified 14 studies meeting criteria for inclusion in this review (See Table 1). In the included studies there were 32 participants with ASD between the ages of two and eight. Of these 14 studies, 6 (43%) took place in an inclusive setting (e.g., inclusive preschool or general education setting for a portion of child's day), 1 (7%) took place in a special education classroom, and 28% (four studies) took place in a clinic room or empty classroom. Studies used a variety of methods to involve typically developing peers. A majority of studies directly trained peer participants to intervene as agents (45%), trained concurrently with target children on social communication intervention (18%) or served as structured play partners without training (37%). Of these studies intervening on social communication target skills, the majority involved social initiations or responses (21%), social interactions or play (45%) or other social communication skills (e.g., appropriate social language, initiating play; 34%). No study intervened directly on joint attention behaviors. Table 1 details the results of this systematic search in greater detail including participant age, intervention type, target child information, and study outcomes.

Table 2.

*Reference, design, agent, setting, and intervention description for joint attention studies.*

Reference	Study			Intervention
Kaale, Smith & Sponheim (2011)	RCT	Teachers	Preschool classroom with clinic pull-out	See Kasari et al., 2006
Klien et. al.,	Three ABC designs	Interventionist	Clinic room	Fading of environmental cues.
Kasari, Freeman, Paparella (2006).	RCT	Interventionist	Not Reported	ABA plus responsively and facilitative interactive methods. Mass trials of specific targeted JA skill plus milieu teaching.
Kasari, Paparella, Freeman, & Jahromi (2008) Follow-up to Kasari, Freeman, Paparella, (2006).	RCT	Interventionist	Not Reported	See Kasari et al., 2006
Krstovska-Guerrero & Jones (2013).	MBL across behaviors	Interventionist	Home	Response to joint attention is taught in combination to smiling.
Lawton & Kasari (2012)	Multiple baseline	Teachers	Classroom	JASPER



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	across participants			
MacDuff, Ledo, McClannahan, & Krantz (2007).	MBL across participants	Interventionist	Hallway	Button activated voice recording with prompting to hit button
Naoi, Tsuchiya, Yamamoto, Nakamura (2008).	Multiple baseline across participants	Interventionist	Clinic	Preferred objects presented behind adult to initiate EO for child initiation of JA.
Rocha, Schreibman, & Stahmer (2007)	Multiple baseline across participants	Parents	Homes	DTT and PRT. Increasingly complex response patterns.
Schertz & Odom, 2007	Multiple baseline across behaviors	Parents	Homes	Developmental foundations of joint attention were strengthened with methods from the Joint Attention Mediated Learning manual.
Schertz, Odom, Bagett, Sideris, (2011).	RCT pilot	Parents	Home	See Schertz & Odom, 2007

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Taylor & Hoch (2008)	Multiple baseline across participants	Interventionist	Clinic	—	Least to most prompting for response to JA, progressive time delay for IJA.
Whalen & Schreibman (2003)	Multiple Baseline across scripts	Interventionist	Clinic		Interventions using core concepts of DTT and naturalistic teaching including child-led activities, turn taking, and reinforcement of correct responses.
Wong (2013)	RCT Pilot	Teachers	Classroom	—	Joint attention vs. Symbolic Play
Wong, Kasari, Freeman & Paparella (2007)	RCT	Interventionist	Clinic	—	Joint attention vs. Symbolic play

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## **Joint Attention interventions**

Table 2 illustrates the resulting studies examining joint attention for young children with ASD. Across the small body of literature on interventions on joint attention skills, there are studies that examine interventions to increase response to joint attention skills, initiations of joint attention skills, and studies that address both skills together. In this body of literature, there are different topographies of behavior recognized as joint attention behaviors. For response to joint attention, almost all of the available literature defines a response to a joint attention bid as a coordinated gaze shift between an object or event and another individual (e.g., Krstovska-Guerro & Jones, 2013; Jones, 2009; Kasari, Freeman, Paparella, 2007; Isaksen & Holth, 2009; Jones Carr & Feeley, 2006). Some studies also identified more complex responses to joint attention bids such as pointing (Jones, 2009) or verbalizing (Jones, 2009).

Topographies of trained IJA responses are considerably more diverse. Most of the studies defined a successful IJA behavior as some combination of a point or gesture and a coordinated gaze shift (e.g., Kasari, Freeman, Paparella, 2005; Wong, Kasari, Freeman, & Paperella, 2007), although some studies also accepted the giving of an object, (Kasari et al., 2005), a verbal bid (MacDuff et al., 2007; Taylor & Hoch, 2008) or a physical interaction such as a child pulling their parent by the arm (Naoi et al., 2008).

Trained interventionists or researchers were the most common agents in the included joint attention research (52%), although several studies used preschool teachers (24%) or parents (19%). One study (Ferraioli & Harris, 2011) used siblings as interventionists. Logically given the distribution of interventionists, most of the included studies took place in clinical settings or during pull out from classroom time (53%),

followed by the home (26%) and classroom (21%). In the small body of extant joint attention literature, there are only a few strategies for the instruction of joint attention discussed. Most of the included studies used either the strategies for teaching joint attention and symbolic play concurrently first identified in Kasari (2006), including the manualized intervention Joint Attention Symbolic Play/ Engagement and Regulation (JASP/ER); a DTT based task analysis first identified in Whalen and Schreibman (2003); behavioral and naturalistic intervention from Jones (2006); or a parent training model first examined in Schertz and Odom (2007).

### **Discussion**

Inclusive preschool classrooms are of potential value for increasing social communication skills of children with ASD (Crosland & Dunlap, 2012; Irvin, Boyd, Odom, 2014). The motivation behind inclusive education is to provide peer models and opportunities for children with disabilities to participate with peers in enriching early childhood activities; however, without targeted intervention, these benefits may not be accessed (Hansen et al, 2014; Carter et al., 2014). Fortunately, there are evidence-based targeted interventions for children with ASD, including promising research on peer-mediated intervention, Only 21% of the identified peer-mediated studies occurred in a classroom context. Classrooms have their own unique set of time limitations, teacher variables, and other considerations that can make them challenging settings for rigorous research (Kaiser & Hemmeter, 2014; Dunst, Trivette, & Raab, 2013). Despite the more controlled environment of a clinical setting, social skills instruction may be too rigid and not flexible to environmental considerations unless generalization is considered.

There is sufficient evidence to suggest that targeted interventions for preschool-

aged children with ASD can ameliorate deficits in social communication (White, Williams, Keonig & Scahill, 2007; Reichow & Volkmar, 2010). Recent reviews of a variety of social communication interventions and targets indicate that well-researched and evidence-based interventions exist to address social communication deficits for preschoolers. This review indicated that, even in less studied areas of research, there is promising evidence (e.g., joint attention, peer-mediated intervention). The reviews included here of preschool aged peer mediated interventions and of joint attention interventions also indicate that there is further need for research in this area as certain skills, intervention agents, and settings have not been studied to the levels of others. For example, peer mediated research for preschool-aged children still shows considerable variability of effects as indicated by this review. Further research is needed to address what adaptations are necessary to unify quality of results in this population. Additionally, extant research on social communication for children with ASD in preschool, for the most part, focuses on skills for a certain developmental level. Pivotal requisite skills, such as joint attention or eye contact, may be indicators of ability to learn more advanced skills but are not always accessed or taught directly (Charman, 2003).

One way to assure that natural opportunities for social communication occur is to directly involve peers in the intervention. In this review, a small body of mostly effective single-case research studies on the use of peer-mediated strategies for intervention on social communication target skills for young children with ASD was identified. The results of this review indicated some variability of efficacy of interventions, indicating that further research is needed in this area. Although results from this review were somewhat variable, previous reviews on this strategy across a larger age range indicate

greater overall efficacy (e.g., Chan et al., 2009). Results shown here seem to indicate that adaptations are necessary to support peer-mediated interventions for this age range. More structured interventions or multicomponent interventions may be necessary.

Additionally, past research has provided minimal information about treatment fidelity, an important characteristic of high quality research. More consideration of adaptation to treatment fidelity checklists to this younger age range is needed.

While there is a growing body of research available on peer-mediated intervention, and some evidence to suggest that it is effective to intervene on social communication targets for children with ASD, research has been centered around a few main categories, including initiation of play and reciprocal interactions (e.g., Jung, Sainato, & Davis, 2008; Nelson, Nelson, McDonnell, Johnston & Crompton, 2007). These are important skills for the preschool classroom and for future skill building; however, there is a gap in the existing research on joint attention. Although theoretically, this skill may have been learned by entry into preschool, much of the current research on joint attention targets children well into the preschool years, indicating that this skill is in need of intervention across early childhood. Results from this review indicated a large age range of participants, from two to seven years old.

Some research suggests that early and pivotal social communication skills, such as joint attention, are foundational for later social skill building, as well as potential effects on other learning such as academics (Bono, Daly, Sigman, 2004). Further research is needed to assess the validity of assuming these skills are pre-requisite skills in order to direct timing of certain interventions. However, some studies did report on joint attention as a secondary variable alongside other more complex play or social communication

skills, and these skills seem to co-vary (e.g., Kasari et al., 2006). Additionally, research indicating that direct instruction on joint attention can improve preschool outcomes infers that joint attention may indeed be a pivotal skill for other, more complex social communication skills (Charman, 2003; Mundy et al, 2015).

Joint attention develops in typically developing populations through natural everyday interactions, such as those found with early conversation and play partners like parents and siblings. For this reason, intervention with parents on joint attention is critical and intervention with those who do not naturally spend time with them is less viable for later generalization to natural settings (White et al, 2003). While parents are one of a child's earliest language partners, there are equal opportunities for interactions with siblings, teachers, and peers. Some research included in this review addressed siblings (e.g., Ferraioli & Harris, 2011) and teachers (e.g., Jones, 2009) but more information is needed about the acceptability of peers as models for age-appropriate joint attention skills.

There is some precedent from the literature for using peer-mediated intervention in a classroom context to teach joint attention skills. For example, Kasari et al. (2006) studied joint attention intervention in preschool classrooms paired with symbolic play intervention to increase language outcomes. Other studies have indirectly assessed joint attention with peers in the context of a teacher or interventionist mediated joint attention intervention, but there is still a dearth of information available on the ability of peers to teach this critical skill. There is a need for more information on more global effects of research on social communication skills within a preschool classroom (e.g., DiSalvo, & Oswald, 2002).

## **Future research**

Results of this systematic literature review both on interventions to increase joint attention and interventions using peer-mediated intervention in the preschool classroom indicated a need for further research in both of these areas, as well as a total lack of literature that combined these areas. Interventions on joint attention typically used one of a few established strategies, and gaps in the literature on joint attention intervention were identified. Particularly, research was typically completed in controlled settings with skilled interventionists and did not take into account natural change agents, environments, or the entire joint attention interaction. Additionally, results of this review indicate research on peer-mediated intervention, while growing, is brief in the preschool age-range and variable.

Peer-mediated research for preschool-aged children comprises an area in need of future investigation. Conflicting results from peer-mediated studies indicate the need for more focused component analyses of peer-mediated interventions to identify the critical features of a peer-mediated intervention. The body of preschool-based peer-mediated research is also variable in terms of how peers are utilized, the timing of training, and the precise role of the peer. Further research is needed in order to determine the most efficacious use of peers, their role on intervention targets, and the optimal age or ability of participating peers. In addition, because intervention components are often highly modified, especially for younger peer participants, little to no treatment fidelity data have been collected on peer use of intervention strategies. In order to better understand how to teach peers to target skills, information must be compiled on how much peers are actually



using the strategies.

In addition joint attention is also an area in need of further research. Recent reviews of joint attention interventions identify the need to examine joint attention in the natural setting and with natural play and language partners (e.g., parents, peers). Further, there is diversity in the definition, explanation, and teaching methods of joint attention. Replication and extension of existing methods are necessary in order to continue to build an evidence base for intervention on this pivotal skill. Additionally, more research is needed on the function and definition of joint attention. Research is also needed across children who are not typically developing, such as those with ASD and other developmental disabilities to understand differences in topographies of joint attention behaviors.

Finally, very young children who are typically developing learn this skill in the context of familiar adults, but the body of research identified by this review shows that this skill is still in need of intervention well into the preschool years for children with ASD. Joint attention deficits in children over three have the ability to detract from parent, peer, and teacher mediated learning opportunities. By embedding intervention into the natural context of the preschool classroom and using peer agents, intervention opportunities on joint attention can be increased and skills improved. Additionally, improvement of this skill by peer agents can increase opportunity for positive social interactions between target children and their peers thus improving levels of overall social engagement. However, this posited theory of change needs more investigation as currently there is a lack of literature on joint attention skills as mediated by peers. More research is needed on peer-mediated intervention on joint attention and on the role of

joint attention in peer interactions more broadly.

### **Limitations of the Current Review**

The current review has several limitations. First, this review examined two very specific slices of the literature on these topics and these findings and assumptions may not be transferable to the broader body of literature. The small number of studies that were identified in this review makes it difficult to examine trends or themes across the literature. Secondly, this review focused only on those studies directly pertaining to joint attention and did not examine those studies that intervened on joint attention as part of an aggregate of early social communication skills. These broader social communication targets including joint attention components may have utilized more natural settings. Additionally, there are varying definitions of peer-mediated in the research. This review used a particular definition of peer-mediated intervention and this may have excluded relevant studies.

### **Conclusion**

This systematic literature review addressed two distinct bodies of literature: peer mediated intervention for preschool-aged children with ASD and joint attention interventions for children with ASD. The purpose of this review was to identify trends in intervention in these two areas as well as gaps in the current bodies of literature. Results indicated that both of these areas are under-researched in comparison to research in other social communication domains and age ranges. Furthermore, there is almost no research combining these two areas, and no study was found that used a peer-mediated approach to teach joint attention in the inclusive preschool classroom. The proposed study aims to fill this gap by examining the use of a peer mediated joint attention intervention on response

to joint attention skills in young children with ASD in the context of a preschool classroom.

## CHAPTER III

### METHODS

The current study aims to fill two gaps in the literature. Primarily, there is a lack of studies on joint attention completed in natural environments. The preschool classroom, in particular is a natural, everyday environment under-researched in terms of early and pivotal social communication intervention. Secondly, this study aims to examine same-aged peers as agents in intervention on response to joint attention skills. This study uses individualized intervention sessions with target children using a joint attention teaching protocol, followed by immediate generalization sessions with trained same-age peers.

This study addresses the following research questions:

1. Is there a functional relation between use of a joint attention intervention and an increase in the level of response to joint attention behaviors to interventionist bids in young children with ASD?
2. Is there a functional relation between training of peers to initiate joint attention and increased frequency of bids to target children?
3. Is there a functional relation between increased peer use of IJA strategies and increased frequency of target child response to joint attention to peer bids?
4. Does intervening on response to joint attention behaviors influence overall levels of engagement between a child with autism and peers?
5. What are teacher perceptions of the feasibility and acceptability of the goals, procedures and intervention outcomes?

This chapter will detail the specific methods of this intervention including participant

characteristics, setting, measures, and procedures.

## Recruitment

### Recruitment Flow Chart

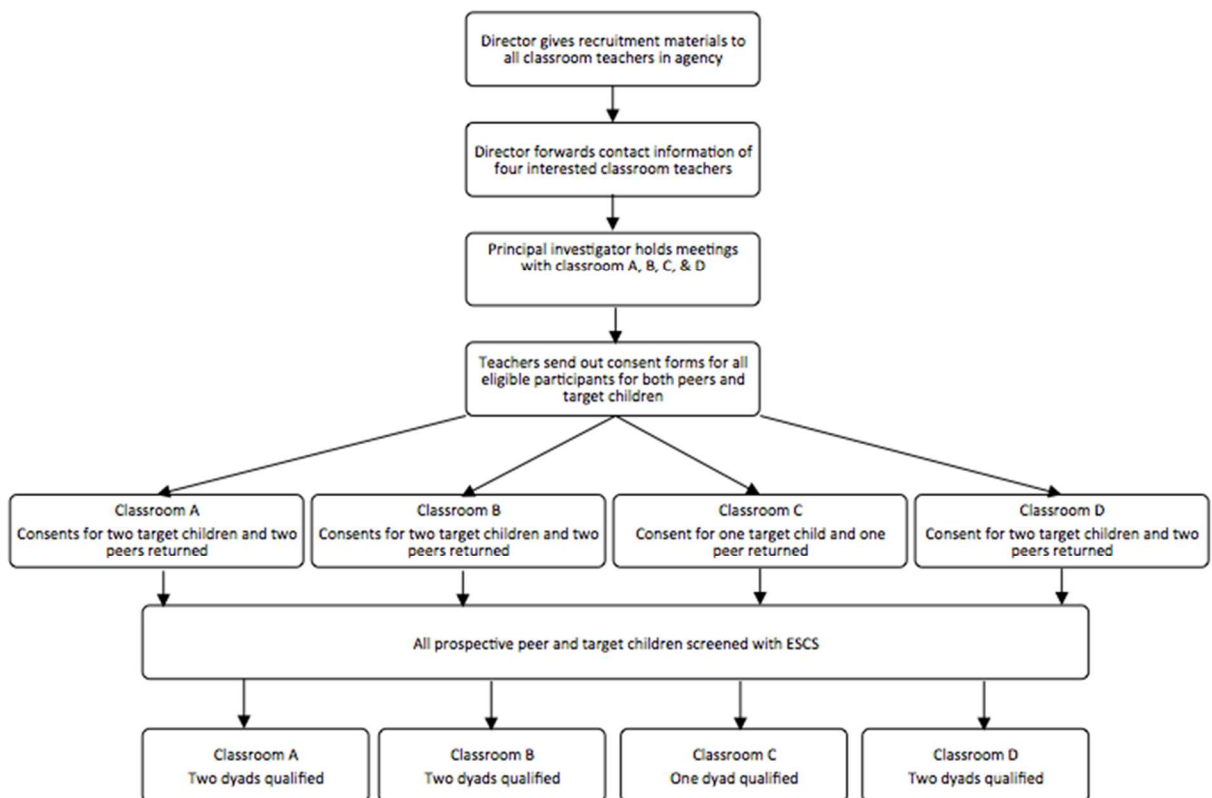


Figure 2. *Recruitment flow chart.*

All participants were recruited through lead classroom teachers. Classroom teachers were recruited by the director of the local EI/ECSE service delivery agency. The director explained the study at a monthly meeting, and followed up with materials from the principal investigator (PI). Interested teachers contacted the director who then forwarded the teacher's contact information to the PI. Individual meetings were held with the lead teachers who had expressed interest, and the PI explained the rationale, methods,

and ideal participants for the study. Teachers were then given consent packets to send home to parents of children who they identified as being appropriate target children or peers. Parents returned the packets including demographic information and signed consent forms and were given a 25\$ gift card. Once parents had given consent, the PI screened the participants using the Early Social Communication Scales (ESCS). Figure 2 illustrates how participants were recruited for participation in this study.

**Recruitment of target children.** Seven children between the ages of 4 and 6 with or at risk for an educational or medical diagnosis of ASD were recruited from children being served in half day reverse inclusion (i.e., some children who are typically developing participate in a classroom of children with special needs) preschool settings in a mid-sized city in the Pacific Northwest. Participants meeting the following requirements were recruited: (a) spent the majority of their school day in an inclusive or reverse inclusion classroom, or participated in a classroom with children with identified disability who have age typical social communication skills; (b) had significantly low levels of response to joint attention and initiation of joint attention behaviors as assessed by the Early Social Communication Scales (ESCS; i.e., scored at least one standard deviation below the mean on the joint attention subscale as well as teacher and parent report); and (c) attended the classroom setting a minimum of two days a week with good attendance record as reported by their teacher.

**Recruitment of peer participants.** Peer participants were recruited to participate in dyads with target children (i.e., no peer participant participated with more than one target child) from the classroom of the target child. Peer participants were recruited that met the following requirements: (a) scored within one standard deviation of the mean on

the ESCS and/or scores within one standard deviation of the mean on the joint attention subscale and higher overall scores than the target child; (b) strong response to and initiation of joint attention skills as measured by the joint attention subscale of the ESCS; (c) teacher report of attending the classroom setting a minimum of two days a week with good attendance, low levels of challenging behavior that might interfere with the intervention (e.g., aggression towards peers), and social interest in target child.

### Participants

Table 3

*Target child participants age, gender, school, peer, race/ethnicity and ASD status.*

	Age	Gender	School	Peer	Race/Ethnicity	Autism Diagnosis
Oliver	5.0	M	B	Lucas	Hispanic/Latino	Educational label
Emily	4.0	F	B	John	Caucasian	Educational label
Arthur	4.1	M	A (AM)	Martin	NR	No label
Aiden	4.2	M	A (PM)	Mario	NR	Educational label
Trevor	4.5	M	C	Jacob	Caucasian	No label
Jason	4	M	D	Michael	Hispanic/Latino	In evaluation
Quinn	4.4	M	D	Theo	Caucasian	Educational label

Table 4

*Peer participants age, gender, school, target child, race/ethnicity, and IEP status.*

	Age	Gender	School	Target Child	Race/Ethnicity	IEP Status
Lucas	4.5	M	B	Oliver	Caucasian	IEP
John	3.7	F	B	Emily	Caucasian	No IEP
Martin	5.2	M	A (AM)	Arthur	Caucasian	No IEP
Mario	3.7	M	A (PM)	Aiden	NR	No IEP
Jacob	3.8	M	C	Trevor	Caucasian	No IEP
Michael	5.2	M	D	Jason	Caucasian	No IEP
Theo	4.8	M	D	Quinn	Caucasian	IEP

Fourteen child participants were recruited. Table 3 provides participant demographics for target child participants. Table 4 provides participant demographics for peer participants. Oliver and Emily attended the same classroom, both in the morning session. Oliver was a 5-year-old male with an educational diagnosis of autism spectrum disorder. Oliver scored a 32 (mild to moderate) on a researcher-administered CARS-R, and a 0% on the joint attention subscale of the ESCS. Oliver spoke in three word sentences. Lucas participated as Oliver’s peer; Lucas was a 4-year-old male who scored a 93% on the ESCS subscale. Lucas was receiving speech and language services.

Emily was a 4-year-old female with an educational diagnosis of ASD. Emily scored a 39 on the CARS-R (severely autistic range), and a 42% on the joint attention



subscale. Emily spoke in one to two word utterances. Jason participated as Emily's peer. Jason was a four-year-old male who was typically developing. Jason scored a 100% on the joint attention subscale.

Arthur and Aiden attended the same classroom. Arthur attended the morning session and Aiden attended the afternoon session. Arthur was a four-year-old Caucasian male currently receiving services on an IEP. Arthur had been previously evaluated for ASD, and scored a 23 (non-autistic) on the researcher administered CARS-R, and a 33% on the joint attention subscale. Arthur spoke in complete sentences except some pronoun reversal. Martin participated as Arthur's peer. Martin was a five-year-old Caucasian male. Martin scored a 100% on the joint attention subscale.

Aiden was a six-year-old male and had an educational diagnosis of ASD. Aiden scored a 38 (severely autistic) on the CARS-R, and a 28% on the joint attention subscale. Aiden sometimes spoke in complete sentences, however he relied mostly on scripted phrases. Mario, a three-year-old Hispanic male participated as Aiden's peer. Mario scored an 85% on the joint attention subscale.

Trevor was a five-year-old male receiving services on an IEP. Trevor's mother reported concerns about ASD and attention deficit hyperactivity disorder (ADHD); however, he did not have an educational diagnosis of ASD or ADHD. Trevor scored a 23 (non-autistic) on the researcher completed CARS-R, and a 60% on the joint attention subscale. Trevor spoke in complete sentences. Jacob participated as Trevor's peer.

Jacob was a three-year-old male. Jacob scored 84% on the joint attention subscale. Jason and Quinn attended the same classroom. Jason was a 4-year-old Hispanic male. At the time of this study he was currently being evaluated for ASD, but had not yet

received his diagnosis. Jason received a 32 on the CARS-R (mild-moderate), and a 43% on the joint attention subscale. Jason spoke in one to two word utterances. Michael participated as Jason’s peer. Michael was a five-year-old male. Michael scored a 95% on the joint attention subscale.

Quinn was a four-year-old Caucasian male with an educational diagnosis of ASD. Quinn scored a 33.5 on the CARS-R, and a 50 % on the joint attention subscale. Quinn spoke in complete sentences. Theo participated as Quinn’s peer. Theo was a four-year-old male and scored a 95% on the joint attention subscale. Table 5 details participant scores on the CARS-R, the CDI-III, and the pre-test administration of the ESCS.

Table 5

*Pre-Assessment scores for target children and peer participant by dyad and classroom.*

	Participant	CARS-R	CDI-III	ESCS Time one
Classroom A	Oliver	32 Mild-moderate	22 3 <sup>rd</sup> Percentile	12.20 Composite 0 RJA
	Lucas	--	14 2 <sup>nd</sup> Percentile	62.93 Composite 0.93 RJA
	Emily	39 Severe	4 1 <sup>st</sup> Percentile	15.42 Composite 0.42 RJA
	John	--	26 4 <sup>th</sup> Percentile	53.00 Composite 1.0 RJA
Classroom B	Arthur	23 Non-autistic	75 35 <sup>th</sup> Percentile	18.35 Composite 0.35 RJA
	Martin	--	58 12 <sup>th</sup> Percentile	64.00 Composite 1.0 RJA
	Aiden	38 Severe	34 5 <sup>th</sup> Percentile	34.28 Composite 0.28 RJA
	Mario	--	26	37.85 Composite

			4 <sup>th</sup> Percentile	0.85 RJA
Classroom C	Trevor	23 Non-autistic	45 7 <sup>th</sup> percentile	26.6 Composite 0.60 RJA
	Jacob	--	80 45 <sup>th</sup> percentile	40.50 Composite 0.84 RJA
Classroom D	Jason	32 Mild-moderate	4 1 <sup>st</sup> percentile	44.55 Composite 0.43 RJA
	Michael	--	80 70 <sup>th</sup> percentile	53.95 Composite 0.95 RJA
	Quinn	33.5 Mild-moderate	35 5 <sup>th</sup> percentile	7.0 Composite 0.50 RJA
	Theo	--	47 7 <sup>th</sup> percentile	44.95 Composite 0.95 RJA

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*Note.* The words and sentences checklist reports percentile ranks up to 37 months. The 37-month percentile chart was used for children over 37 months. Composite ESCS scores were calculated by summing scores in all five subsections. RJA= response to joint attention.

**Interventionist and data collectors.** The principal investigator (PI), an advanced early childhood special education doctoral student with five years' experience in implementing interventions with children with ASD, was the primary adult interventionist for this study. Data collectors were doctoral students with between two and eight years' of research and teaching experience. One data collector was an undergraduate student who had several years' experience working with children with autism and prior experience working with this particular intervention.

### Setting

Participants attended reverse inclusion classrooms. Students from a total of four classrooms participated. Sessions with the interventionist took place in a hallway or

office space as available. Sessions with the peer took place in the classroom during either center time or free play at an activity center. Activity centers are specified areas of the classroom typically devoted to a developmental domain. For example, the fine motor center features teacher-supported activities that encourage use of fine motor skills, such as art projects and small manipulative materials.

**Classroom A.** Two dyads (i.e., Oliver and Lucas and Emily and Jason) attended classroom one during the morning session. Classroom one was a single preschool classroom in a church otherwise used for an alternative high school and religious services. Sessions with the PI took place in one of two empty classrooms. Classrooms were empty except for folding tables and chairs. Both classrooms featured a wall of windows and some pre-existing artwork and lighting (i.e., chandeliers). Peer sessions took place during groups in the circle time area, which featured a circle of child-sized chairs and a large board the teacher used for calendar and felt-board activities during circle. Sessions took place on the circle time rug.

**Classroom B.**

Two dyads participated from classroom two: Arthur and Martin in the morning session and Aiden and Mario in the afternoon session. Classroom two was in a series of preschool classrooms in a building that served early intervention and Head Start populations. Sessions with the PI took place in a hallway. There was a child-sized table and chairs outside all classrooms on this hallway for the purpose of pull out speech and discrete trial teaching sessions. Sessions with the peer took place during free-play at a work station. The station had a child-sized table and chairs in an alcove 8 ft by 6 ft.

**Classroom C.** One dyad, Trevor and Jacob, attended classroom three. Classroom

three was on the campus of a public elementary school. Sessions with the interventionist took place in the hallway at a child-sized table. Sessions with the peer took place at a workstation that had a screen on three sides. The work-systems station featured a small octagonal table and two child-sized chairs.

**Classroom D.** The last two dyads, Jason and Michael and Quinn and Theo, attended classroom four. Classroom four was on the campus of a public middle school. Sessions with the PI took place in the teacher's office. This was a small (10 ft by 12 ft) room with one window and a table and chairs between two desks. The room also had a refrigerator and a counter with a sink. Sessions with the peer took place during center time or free-play in an area used for fine motor group. The area had low white walls and a collapsible blue table. Sessions were also sometimes completed on the floor in this area.

### **Materials**

**Stimuli.** Unique objects were placed in the environment during all sessions with the PI to serve as stimuli for joint attention interactions. Objects were rotated in sets of three and featured a) one light up object (i.e., fiber optic lamp, glowing ball, fake jellyfish tank); b) one silly stuffed animal (i.e., horse in a dress, multicolored pig, big bird); and one flat or paper object (i.e., paper fish, unicorn star, jungle animal decoration). Items were placed at random around the space at a minimum distance of three feet from the participant and a maximum distance of six feet from participant. A list of material sets is available in Appendix B.

During peer interventionist sessions in baseline, items were placed at random in the designated area of the classroom, within the area and in normal eye range. Once peers entered intervention, they were instructed to choose a location for the objects.

**Games and activities.** Based on results of the preference assessments, simple cause and effect games were chosen to be the activity during most sessions. At the beginning of each session, participants were given the choice between the available games including the following: (a) Don't Break the Ice; (b) Jumping Jack; (c) Hungry Hungry Hippos; d) Pop Up Pirate; (e) Let's Go Fishin' Game; and f) Connect-Four. During peer sessions, target children selected the game they would play with the peer, or for classrooms where intervention took place during free play, the target child could also select from free play activities (e.g., sensory bin, block area).

### **Target Behaviors and Data Collection**

Data were collected in baseline and intervention phases for (a) target child response to joint attention behaviors with adult interventionist and (b) target child response to joint attention behaviors with peers. Additionally, data were collected on (c) peer bids for joint attention; (d) peer intervention fidelity; (e) target child engagement in the classroom; and (f) interventionist task fidelity for all three intervention phases. Data sheets are available in Appendix A and B.

Target child data was collected with a data sheet available in Appendix B and was the percent of interventionist bids with a prompted or unprompted response to joint attention across a 10 min interval with bids presented approximately once every one to two minutes (i.e., a minimum of five bids per session). Data were collected on level of prompt necessary to elicit a child response as well as topography of joint attention behavior. Joint attention behaviors were operationally defined to include (a) eye gaze shift that occurs within 30 s of the bid and sustains for a minimum of 2 s, (b) head turn that occurs within 30 s of the bid and ends in the child turning their head until object is in

view, and/or (c) body reorient which involves the child moving towards object until they are within 2 feet of object or object is clearly in view. Gaze shifts, head turns, or body reorients towards the object or event after 30 s were not counted. Gaze shifts, head turns or body reorients that did not end in the child looking at the object were not counted. Similar data are collected for response to peer bids (see Appendix B).

Data were collected on peer IJA to target child as frequency (i.e., How many bids are made in a 10 min period ?) as well as topography of child bid. A peer behavior was considered a bid for joint attention if the child (a) looked at an item or event and labeled it (e.g., tiger) or otherwise verbalized (e.g., Ahh!), (b) used an index finger to point towards or used one or more hands to gesture towards an item, (c) attempted to show an item to peer (e.g., brought item closer to peer), or (d) lead peer to item. Peer responses to adult prompts that did not attempt to gain the attention of the target child (e.g., the peer brought the item to the interventionist or showed the interventionist) were not counted. Additional data were collected on peer task fidelity (task fidelity checklist available in Appendix B).

### **Data Collection and Inter-observer Agreement (IOA)**

All data were collected in-vivo by a trained data collector, with video recording for IOA. A data collector was present at all sessions to take data on interventionist treatment fidelity and child behavior. Adult interventionist procedural fidelity, child data, and peer interventionist treatment fidelity data were taken in-vivo with pen, paper data sheets and smart phone timers (see Appendix C).

**Data collector training.** Data collectors and reliability observers were trained using training materials for interventionists and video examples from a pilot study (see

Appendix A). Data collectors received a two-hour training session on data collection for (a) interventionist procedural fidelity in baseline and intervention; (b) target child response to interventionist bids; (c) target child response to peer bids, and (d) peer interventionist treatment fidelity. During this training, data collectors watched three model videos and practiced coding with feedback from the principal investigator. Discrepancies were discussed as a group until all data collectors were able to code example videos with 100% fidelity. During baseline and intervention, IOA data was immediately compared. In the case that IOA fell below 80%, a brief version of the training was administered and a training video was coded by the data collector with feedback from the primary investigator on accuracy.

**IOA.** A MacBook Pro® laptop computer with video capability was used to capture video in the Quicktime® program to attain inter-observer agreement (IOA) on data collected. For two participants, both in classroom B, the parents did not grant video consent. IOA was collected in vivo for these participants. IOA was calculated on 43.4% of sessions. IOA was calculated point-by-point, meaning that items with disagreement were subtracted from items with agreement, divided by all items and multiplied by 100 to obtain a percentage.

### **Additional Measurement**

**Early Social Communication Scales (ESCS).** The Early Social Communication Scales is a structured observation measure that provides measures of individual differences on nonverbal communication skills typically developing in children between 8-30 months (Mundy, 2000). The instrument focuses on three main areas of non-verbal communication: joint attention behaviors (i.e., non-verbal behaviors used to share the



experience of objects or events with others), behavioral requests (i.e., ability to use non-verbal communication to gain help with or access to an object), and social interaction behaviors (i.e., ability to engage in playful turn-taking with others). Each of these categories is further classified into initiations and responses. The abridged, research version of this tool was used for the purpose of this study (Mundy, 2003). This tool was normed on a small sample (14 children), but has been used across multiple studies on joint attention with a Pearson's  $r$  correlation of .90 between studies (e.g., Mundy & Gomes, 1998; Mundy, Sigman, Kasari, 1990) The ESCS was administered on the target children pre/post, as well as to qualify advanced peers for participation.

The ESCS was administered following the guidelines available from the research version manual, in approximately 30 minute long sessions. This assessment features both brief tasks (e.g., following a one step direction, taking turns), and activities designed to elicit social referencing, joint attention, and behavioral requests. For example, one subtask instructs the administrator to blow up a balloon and let the air out. The child is given points if they alternate their gaze between the balloon and the administrator. Another task asks that the administrator place a wind up toy in a jar, and hand the jar to the child. The child receives points if they hand the jar to the administrator to open to retrieve the toy, or otherwise gesture or ask for help from the administrator. Scores are provided in five subscales: initiating joint attention (points or gaze shifts from the child to the administrator); responding to joint attention (percent of bids from administrator with a correct response); initiating behavioral requests (reaching, making eye contact, or otherwise appealing for an object or action); responding to behavioral requests (correct responses to the administrator's request for objects, with or without gesture); and

responding to social interaction (turn taking, eye contact, appeals for social attention).

The response to joint attention subscale of this assessment was used separately. The first activity of the response to joint attention subscale features the administrator pointing to posters on the wall and stating the child's name. Two posters are placed directly behind the child and one to either side of the child. The child receives points if he looks at the poster. During the second component, children are shown a picture book, and the administrator points to images in the book with her index finger and says the child's name. Children are given points for shifting gaze towards the picture.

**Macarthur Bates Inventory.** The Macarthur Bates Inventory is a brief questionnaire appropriate for parents or teachers to complete that provides a list of commonly used words by children between the ages of 30 and 36 months. Parents and teachers answer by selecting from a list of 100 words those words that they have heard the child use. The CDI-III has been normed and validated on a large sample across multiple studies (e.g., Feldman, Dale, Capbell, Colborn, Kurs-Lasky, Rockette, & Paradise, 2005; Heilmann, J., Weismer, S. E., Evans, J., & Hollar, C., 2005). The CDS-III was completed by parents of typically developing peers and target children as well as teachers.

**Childhood Autism Rating Scale-Revised (CARS-R).** Target child autism severity was rated using the CARS-R (Schopler, Van Bourgondien, Wellman, & Love, 2010). CARS-R protocols were completed by a trained and reliable administrator via observation and teacher report. The assessor gathered information about the child's functioning on various diagnostic criteria for ASDs. For example, there are items about communication, play skills, and rigid and repetitive interests and behaviors. The CARS-R

has been validated as a sensitive and reliable diagnostic tool for ASD, as well as sensitive to different classifications of autism (e.g., mild to moderate, severe; Reszka, Boyd, McBee, Hume, & Odom, 2014). In this case, the CARS-R was completed by the PI in conference with the child's classroom teacher.

### **Preference assessment**

**Potential tangible reinforcers.** Parents of all participating children completed an indirect preference assessment for potential tangible reinforcers (i.e., activities and edibles) with an indirect preference assessment administered via a brief parent survey. For example, the survey asked “What does your child like to play with?” or “what small foods or rewards does your child enjoy?”. Using results from the indirect preference assessments, both target participants and peer participants were given systematic preference assessments to identify a hierarchy of preferred items to be delivered following target behavior as putative tangible reinforcers. The teachers completed a survey, which was used to determine if it was appropriate to use a multiple stimulus without replacement (MSWO) or a paired stimulus preference assessment (i.e., if the child is able to select from an array; see Appendix E). For economy of time, where possible, MSWO procedures were used, meaning all options were presented at one time and participants selected their preferred item from the array. Once an item was selected it was removed (and consumed in the case of edibles) and the remaining items are presented in a different array (Deleon & Iwata, 1996). Preference assessments for edibles from the parent- completed indirect preference assessment were conducted before baseline sessions began to identify a hierarchy of edible preferences. Immediately prior to intervention a brief preference assessment was conducted to identify highly preferred

items to deliver following target behavior as a putative reinforcer. Activities and edibles were assessed separately.

**Edibles.** For edibles, preference assessments lasted three trials and started with five items. The participant was allowed to sample each of the presented items before beginning the assessment. Prior to the assessment they were able to consume one of each edible (e.g., one fruit snack). At the beginning of each trial, items were randomly sequenced on a paper plate or tray with items placed approximately two inches apart. The participant was instructed to “pick one”. Once the participant had selected an edible, remaining items were removed from view and the child was given 10-seconds to consume the edible. Remaining edibles were reordered and represented. This procedure was continued until all edibles were removed or the child failed to select an edible after 10 seconds. At the start of a new trial, items were presented in a new random order. Results are reported as a hierarchy of preference as determined by calculating the number of times an item was selected over the number of times it was available in each trial, and summing the resulting ratios. The resulting number was multiplied by 100 to obtain a percentage, and these percentages were ranked from smallest to largest and represent the child’s relative preference for each presented edible in comparison with the other edibles.

A MSWO preference assessment was preferred because of time constraints, but one participant (i.e., Emily) was unable to select from a large array. For Emily, preferences were assessed using a paired stimuli preference assessment, meaning that two options were presented simultaneously in systematically rotated pairs to elucidate a hierarchy of preferred edibles. Two edibles were presented from the identified potential reinforcers and placed five inches apart on a table in front of the child. This participant

was then asked to “pick one”. If she touched one of the two items, she was given 5 second to consume the edible and the other edible was immediately removed. Each edible was presented at least once with each other edible and the position (i.e., left or right of the child’s midline) was systematically altered to account for possible positional preference. Edibles were presented in matched pairs until a hierarchy could be determined (see data sheet in Appendix D). A hierarchy was determined by dividing the number of times the edible was consumed by the number of times it was presented, multiplying that number by 100% and ranking percentages by size.

**Activities.** In a separate preference assessment from potential edible reinforcers, preference for activities were determined using the same procedures as edibles (i.e., MSWO if participant is able to select from an array and paired stimulus if unable to select from an array). Preference for activities was assessed using laminated cards with a 3” X 5” inch color photograph of the activity and a short description (e.g., a picture of the sensory table and “play with water beads”), with immediate contingent access to a proxy for the selected activity. For example, if the child selected “sensory table”, they received 30 seconds of access to a small bin with sand and small toys. At the start of every session, a brief preference assessment was conducted for options available that day (e.g., “Do you want to play the ice game or the bunny game?”).

### **Peer engagement**

The engagement of the target child with their peers was measured in brief 10-minute observations before and after intervention. Engagement data were collected using 10 second partial interval recording. Partial interval recording requires coding the occurrence or nonoccurrence of target behavior during pre-specified intervals of time

(e.g., 10 seconds; Harrop and Daniels, 1986). Engagement was defined as the target child being in close proximity to a peer, playing with the same materials as a peer, exchanging verbal communication with a peer and/or looking directly at peer. Data were collected using the data sheet available in Appendix A and an interval timer app on a smartphone connected to a headset. IOA was collected on all probe data.

### **Social validity**

Social validity was measured using an adapted version of the Treatment Acceptability Rating Form- Revised (TARF-R). This form asked teachers to rate their perceptions of the utility, acceptability and feasibility of these intervention goals, procedures, and outcomes. The revised version of the TARF-R is included in Appendix F.

### **Experimental Design and Data Analysis**

The effects of the intervention on target child response to joint attention with interventionist (prompted and unprompted), peer frequency of bids for joint attention to peer, and target child response to joint attention with peer were assessed using individual concurrent multiple baseline designs across participant dyads. One multiple baseline design included three dyads and a second multiple baseline design included four dyads. A multiple baseline design provides experimental control by utilizing repeated baseline measurement and by staggering introduction of intervention across a minimum of three different individuals at three different points in time (Gast, 2009). Introducing the intervention at different points in time controls for extraneous variables such as maturation and history. Thus, a multiple baseline design with three participants offers the researcher three opportunities to illustrate a functional relation between introduction of

the intervention and dependent variables. Multiple baseline designs are especially relevant for interventions where skill acquisition (e.g., joint attention skills) is expected over time, and the withdrawal of an intervention would not be expected to demonstrate experimental control (Gast, 2009).

**Data analysis.** Data for the multiple baseline design across participant dyads were analyzed using traditional standards for visual analysis (i.e., graphed data were examined for change in level, trend, variability, immediacy effect, vertical analysis across tiers, and demonstrations of similar effects across independent tiers; Horner, 2005). Additionally, a non-parametric overlap indicator, Tau-u, was calculated, as well as a parametric d-estimator. Tau-u is a non-parametric overlap indicator that combines the percent of non-overlapping data with trend in intervention phase and has some limited ability to control for trend in baseline data (e.g., autocorrelation). Tau-u was calculated for resultant data using the online calculator at [singlecase.org](http://singlecase.org) (Parker, Vannest, Davis & Sauber, 2011). According to guidelines for interpreting Tau-U, a score of .65 or lower is interpreted as weak, .66-.92 as medium to high, and .93 or higher as large (Parker and Vannest, 2009).

Additionally, Hedges' g, a d estimator that provides a proxy for a Cohen's d effect size measure was calculated. Hedges' g provides a parametric estimate of effect size of the intervention and was calculated using the DHPS SPSS macro (Hedges, Pustejovsky, & Shadish, 2012).

Scores on the ESCS were analyzed using t-tests. A t-test allows for the comparison of means between two groups to see if differences between these groups are significant. For example, this analysis shows significance of change in social communication skills, where a higher score on the ESCS post intervention can be

determined to be significantly higher than the original score, or a greater change than could be attributed to random chance. T-tests for ESCS total scores and joint attention subscale scores were calculated using a paired sample t-test, which is appropriate for comparisons between the same set of participants across two different points in time.

### Procedure

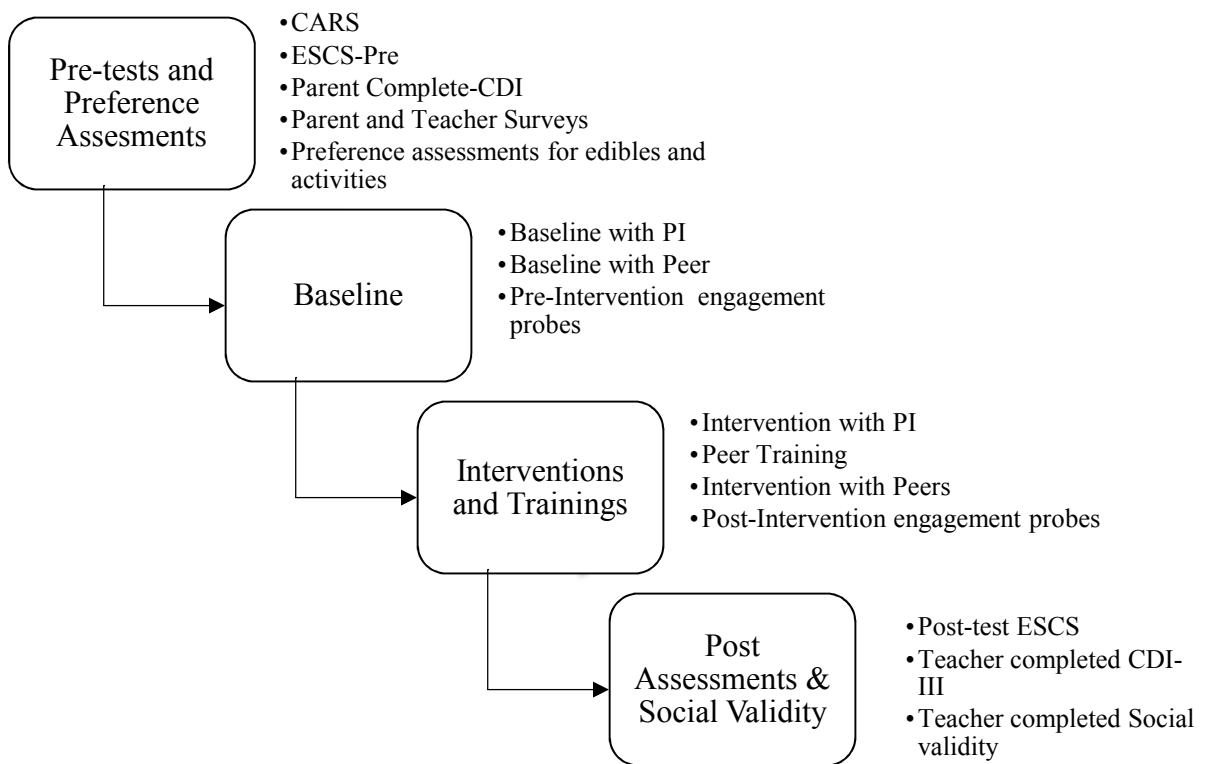


Figure 3. *Data collection and intervention order.*

Table 3 outlines the order of data collection and which data were collected during which phase of intervention.

### Baseline with the Principal Investigator

Baseline with the PI took place outside the classroom or other designated space



immediately prior to baseline sessions with target children inside the classroom. The PI and target child engaged in a simple cause and effect game that was preferred but not highly preferred (as assessed by preference assessment; e.g., Don't Break the Ice, Jumping Jack). Special stimuli were set up in the hallway such as posters, novel objects, and unusual play items (e.g., a stuffed animal in a costume). In addition, naturally occurring stimuli (e.g., children walking by, child artwork in the hallway) were capitalized on for joint attention bids. Baseline data collection lasted a minimum of five sessions or until intervention was appropriate due to stable data and vertical analysis. Baseline sessions ranged between 6 and 12 sessions. Baseline sessions took place 2-3 times a week. Baseline with the PI was completed during short (10 minute) play sessions. During the play sessions, the PI made bids for joint attention at a rate of approximately once every one to two minutes (a minimum of 5 bids made per session). During baseline, PI bids were a simple point and/or gaze shift towards the object or event (e.g., towards a poster on the wall), with a label (e.g., Look at that dog!). The PI did not deliver any further prompts during baseline (i.e., would simply point at the object or event and say "Name of child, look" without repeating or prompting further). If the child responded to the joint attention bid, the PI would briefly comment on the object (e.g., "Yes, that's a blue light"), but no other consequence was delivered. Materials available for baseline and intervention were identical and featured three sets of materials so as to eliminate any preference effect. That is, stimuli placed in the environment (e.g., posters, novel objects) were rotated in sets of three objects to account for any differences in response to joint attention behavior to certain objects. During baseline, edibles were offered following child compliance such as staying at the table and following basic instructions according

to a VR-1 schedule of reinforcement, meaning that for approximately every correct response to a request from the PI, an edible was offered. During baseline, when the PI was not pointing out JA objects, the PI engaged the child in play with the game or activity. The PI's play with the target child was meant to mimic a friendly but untrained adult without instruction on joint attention or other targets (e.g., language expansions, mand training, or incidental teaching). The PI treatment fidelity checklist is available in Appendix B.

### **Baseline with peer**

Baseline sessions with target children and peers took place during center time or free-play in a specific area of the classroom set up to contain similar stimuli to those used outside in the hallway (e.g., posters, toys, novel objects). Center time typically involves children rotating in small groups between different centers focused on different developmental domains. Free-play in these classrooms generally meant a free operant arrangement allowing for children to freely choose among several available activities often related to the teacher selected thematic unit (e.g., during the gardening theme bins of dirt with seeds and plastic flowers). During baseline sessions with peer, the peer and target child rotated into the same "joint attention center". The target child and peer participant engaged in an activity at the "joint attention center" for the duration of one center time rotation (about 10 minutes). The PI was present during baseline sessions in the preschool classroom but only interacted with the peer-target child dyad to ensure that participants remained in the designated area and to resolve conflict (i.e., sharing of materials). The PI did not prompt initiation or response to JA bids from either participant, or engage in language or play facilitation strategies. A task fidelity checklist for PI

behavior during baseline is available in Appendix B. During rotation at the “joint attention center” in baseline, PI, peer and target child engaged in play activities (e.g., sensory table, blocks, game) identified by prior preference assessment. An activity identified as a mutually preferred play activity for both the target child and the peer participant was available in all baseline and intervention sessions. During baseline, joint attention targets (e.g., an interesting object on a shelf such as a toy or a light) were present and arranged by the PI to be within sight of the peer and target child. The peer was not prompted by the PI to point out the new objects to the target child during baseline, however data were taken on rare incidental instances of initiations of joint attention and graphed. For example, in one instance a peer participant pointed to a picture of himself, said the target child’s name and then “Look!”.

### **Peer training**

Peer training took place in the hallway. Peer training consisted of a social narrative indicating how to get the target child’s attention, how to direct attention towards an object/event (i.e., initiation of joint attention) and reinforcement of the child’s response to joint attention bids. The social story contained modified elements of the prompting hierarchy used by the interventionist. For example, the social story had the text “When we want our friends to look at something, we can point at it,” with visuals. The same visuals were used for all participants. Preferred edibles were also delivered after each training session, as well as an opportunity to play a game with the interventionist. An example of a social narrative can be found in Appendix G. Directly following the social narrative, the peer was asked to answer simple comprehension questions (i.e., What do you do to show your friends cool things? What if your friend

doesn't look?). If peer participants were not able to answer these questions verbally, picture cards illustrating the correct answer to each comprehension question were used to prompt peer responding. The PI also asked the peer to "Show me how you'll show your friend what you see," and used modeling, feedback, and social praise to teach the peer how to best elicit a response to joint attention response. Reading the social narrative, role-play, and modeling took place every intervention session directly before the child and peer intervention session.

### **Intervention with Principal Investigator**

Intervention with the PI took place in the same setting as baseline with the same materials. The PI used least to most prompting and delivery of a preferred tangible (edible or small deliverable such as a fruit snack or piece of a cookie) to teach joint attention skills. The prompting hierarchy moved from the least intrusive prompt, a gaze shift, to a gaze shift and point, a partial physical prompt (i.e., child is tapped on the shoulder and asked to look) and finally to a full physical prompt (i.e., child's body is directed towards stimuli) as the most intrusive prompt. The PI used 3-5 second time delay, meaning she gave between three and five second wait time before moving on to the next prompt. For example, if the child did not turn and look at the object in the hall after they interventionist said, "Look at that blue light!" while looking towards the blue light, the PI waited three to five seconds, then pointed towards the blue light and repeated "Look at that sparkly blue light!." Task analyses of the prompting hierarchy are available in Appendix B. As in baseline, the PI attempted to elicit a response to joint attention response approximately once every one to two minutes, with a minimum of five initiations per session. The PI also used naturalistic teaching strategies such as remaining

face to face with the child, and expanding on the child's interests. A preferred edible was delivered once the child had engaged in the entire joint attention interaction (i.e., looked at the item and back at the interventionist). Task analyses for these interventionist behaviors are also available in Appendix B. Data were collected on child response to interventionist bids both prompted (e.g., required a partial physical or full physical prompt) and unprompted (e.g., happened after the interventionist looked towards or pointed at the object and said "look!"). Data sheets are available in Appendix A.

**Intervention with peer.** Intervention sessions with the peer took place in the same environment as baseline sessions with the peer. Intervention sessions with the peer were approximately 10 minute long sessions and took place at the joint attention center in the classroom. Intervention with peer took place within 15 minutes of intervention with interventionist (i.e., as soon as the interventionist had read the social story to the peer participant). As in baseline, the PI was present to support play (e.g., managing sharing of materials, maintaining engagement, scaffolding switches between activities as necessary). The PI reminded the peer participant to show their friend objects in the environment every 2-3 minutes, if they did not provide bids independently. Data were collected on response to peers bids, the frequency of the peer initiations, and a rating of peer implementation fidelity. Data sheets are available in Appendix A.

## CHAPTER III

### RESULTS

This chapter will describe the results of the study. More specifically, this chapter will detail (a) results of the interventionist-mediated response to joint attention intervention; (b) results of a peer training on initiation of joint attention using a social narrative; (c) results of a peer-mediated response to joint attention intervention; (d) results of the calculation of a non-overlap effect size indicator for single case data (i.e., Tau-U) and statistical analyses of the single case data presented in this paper using Hedges-g; (e) results of pre-post measures analyzed with t-tests (i.e., ESCS; engagement); and (f) teacher ratings of acceptability, feasibility and effectiveness of the intervention.

#### **Results of the interventionist-mediated response to joint attention intervention**

Data collected as results of the interventionist-mediated joint attention intervention aimed to answer the research question, “Is there a functional relation between an interventionist-mediated response to joint attention intervention and the level of response to joint attention behaviors in young children with or at risk for autism spectrum disorders?” To answer this question, data were collected for two concurrent multiple baseline designs across 7 dyads. The first multiple baseline design included four dyads and the second multiple baseline design included three dyads.

**Figure 4.** Figure 4 illustrates data for the first multiple baseline, which included a total of four potential demonstrations of a functional relation across four participants with ASD. Data indicated a strong functional relation because of change in level and or trend for all four participants with no overlapping data. Additionally, vertical analysis revealed no

change in baseline data concurrent with intervention in other tiers. Weighted, averaged Tau-U across tiers was 1.0 suggesting a strong effect.

## Response To Interventionist Bids

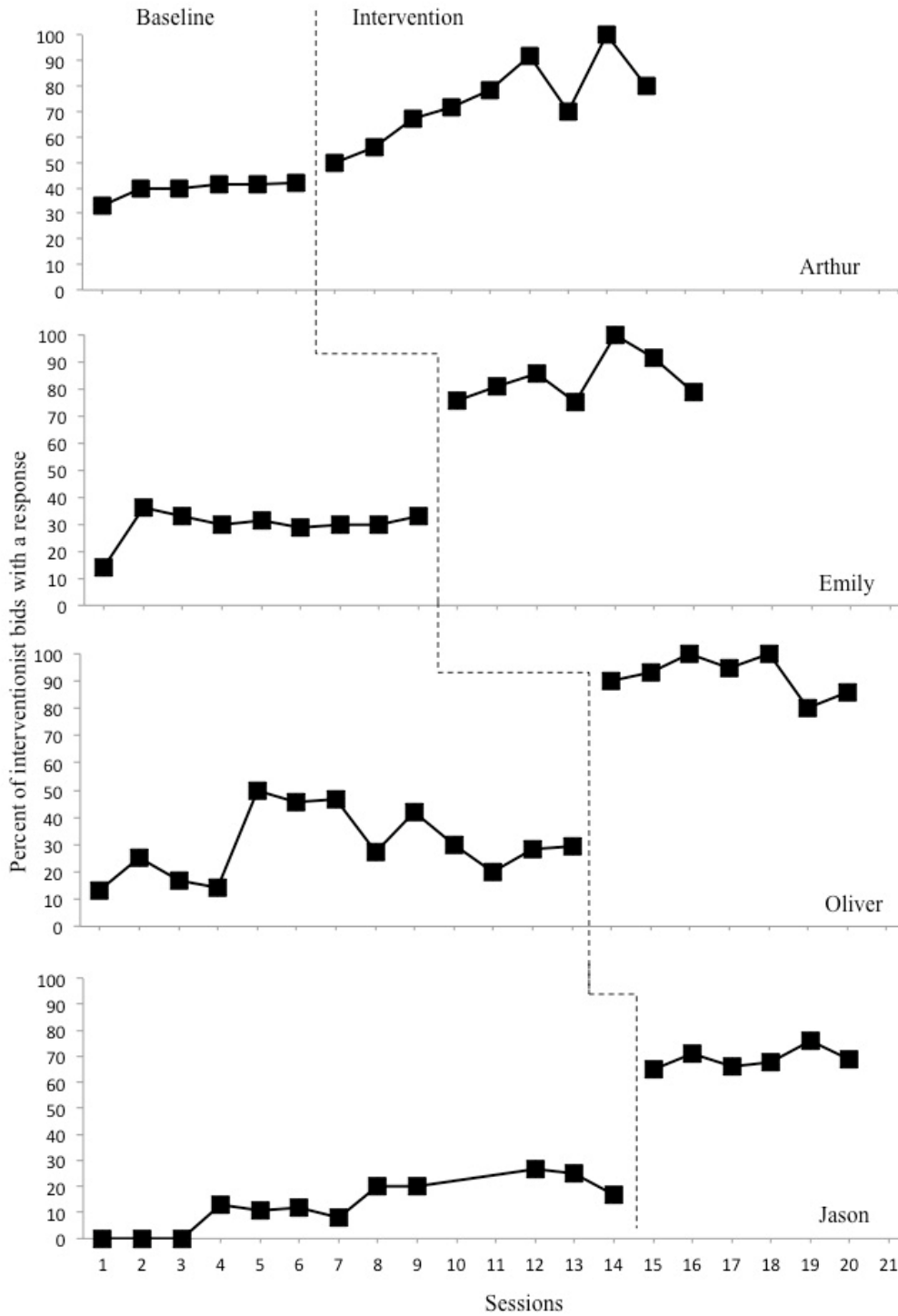


Figure 4. Target child response to interventionist bids for Arthur, Emily, Oliver and Jason.



**Arthur.** Arthur's response to joint attention bids from the interventionist data were low and stable in baseline. Arthur's responding in baseline averaged 39.8 percent with a range of 33 to 42 percent. After intervention, data indicated only a small change in level, but a gradual and increasing trend. Towards the end of intervention some variability was observed in Arthur's data. During intervention Arthur independently responded to an average of 73.9% of bids for joint attention, with a range of 50 - 100%. No overlapping data was evident in Arthur's data. Tau-U was calculated at 1.0.

**Emily.** Emily's baseline data indicated some initial change in level. Emily engaged in higher levels of challenging behavior (e.g., crawling under the table, leaving the play area) at the beginning of baseline, but her responding became less variable with increased familiarity with the interventionist and data collectors. Emily's mean score during baseline was 30%. Following intervention, Emily's data showed an immediate change in level. This change in level maintained, although data became mildly variable towards the end of data collection. During intervention Emily's data has a mean of 84%, with a range of 75 to 100%. No overlapping data is evident. Tau-U was calculated at 1.0.

**Oliver.** Oliver's baseline data indicated high levels of variability. Following a two-week spring break (indicated as a dash in the data), Oliver had elevated levels of response to joint attention behaviors compared with his initial data points, creating some trend in baseline. Thereafter Oliver's data stabilized, and during baseline had an average of 30% with a range of 13 - 46%. Following intervention, Oliver's data indicated a substantial and immediate change in level, which sustained through intervention. Oliver's intervention data have a mean of 92%, with a range of 80 - 100%. Tau-U was calculated at 1.0.

**Jason.** Jason showed low levels of responding during baseline. Jason was absent for large portions of baseline (see dashes in data path). While still very low overall, Jason's data did indicate some upward trend in baseline. Jason responded to bids from the interventionist at an average of 12.8% during baseline sessions, with a range of 0 - 27%. Following intervention, Jason's data indicate a substantial change in level, although Jason's response to joint attention was still consistently lower than other participants. Jason's intervention average spontaneous response to joint attention was 54% with a range of 65 - 76%. Tau-U was calculated at 1.0.

**Figure 5**

The second concurrent multiple baseline had three participants. Participant dyads "Trevor and Jacob" and "Quinn and Theo" had consistent absences and scheduling difficulties, so data were taken on a probe schedule. Visual analysis of this multiple baseline/multiple probe design across participants indicated three demonstrations of effect across three different points in time, indicating a strong functional relation between the interventionist mediated response to joint attention intervention and levels of response to joint attention behaviors. Weighted, averaged Tau-U was 1.0 across tiers.

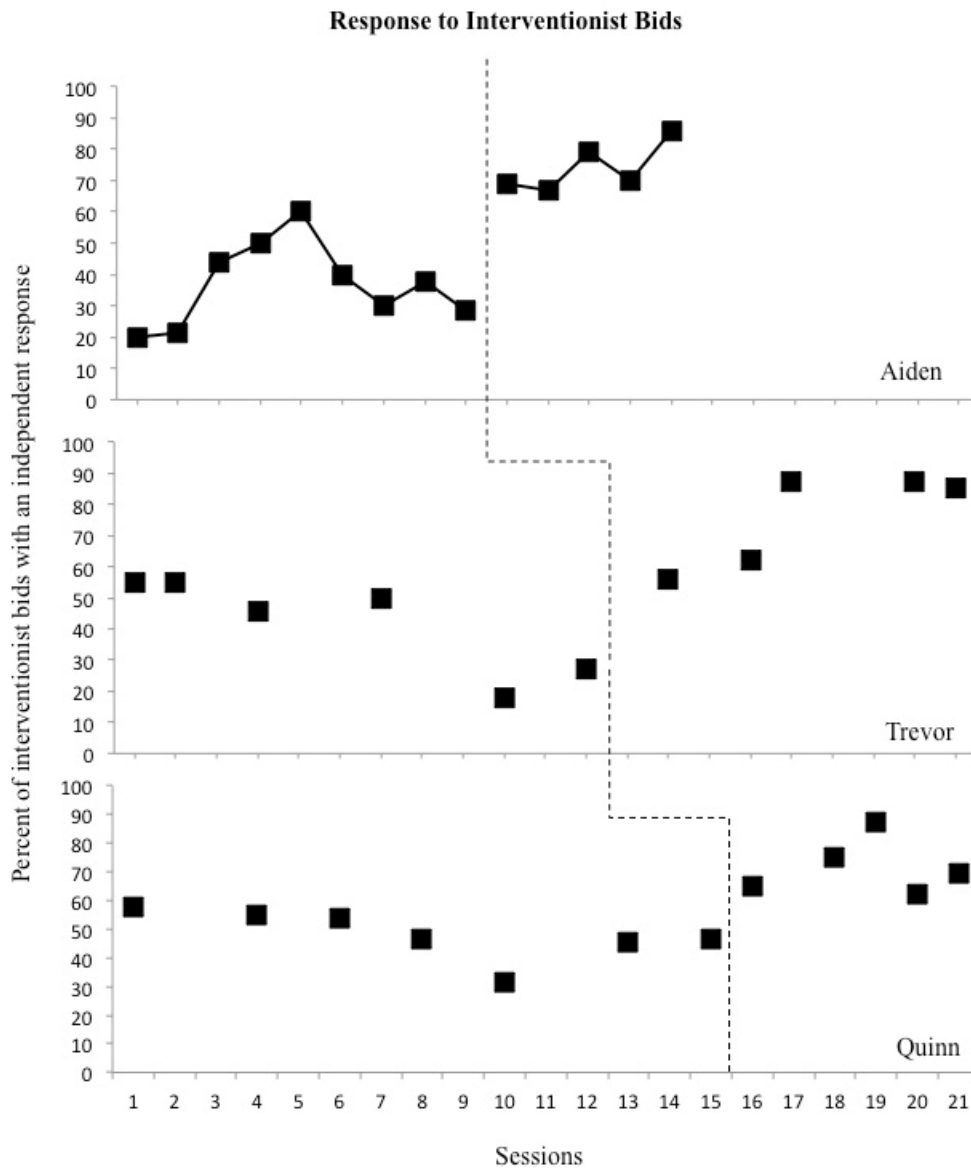


Figure 5. Target child response to interventionist bids for Aiden, Trevor, and Quinn.

**Aiden.** Aiden’s baseline data initially showed substantial increasing trend. However, prior to intervention, a decreasing trend was observed. Aiden’s level of response to joint attention behaviors during baseline had a mean of 37% with a range of 20 - 60%. Following intervention, data indicated an immediate change in level, with a small upward trend. Aiden’s mean response to joint attention bids from the

interventionist in intervention was 74.20% with a range of 67 - 86%. Aiden's data showed no overlapping data. Tau-U was calculated at 1.0.

**Trevor.** Trevor had high initial responding in baseline as compared with his peers. Some decreasing trend was evident in his baseline data. Trevor's baseline data had a mean of 44%, with a range of 18 - 54.8%. Following intervention, a small change in level was observed as well as an increasing trend in intervention. Trevor's intervention data had a mean of 76% with a range of 56 - 86%. Trevor's data indicate no overlapping data. Tau-U was calculated at 1.0.

**Quinn.** Quinn's data also indicated higher initial levels of response to joint attention than other participants. Quinn's data showed little variability in baseline. Quinn's baseline data had an average of 48% with a range of 31 - 58%. Following intervention, a small change in level was observed, and data remained stable throughout intervention. Quinn responded to bids from the interventionist at a mean of 73% during intervention with a range of 61 - 88%. Quinn's data showed no overlapping data. Tau-U was calculated at 1.0.

### **Results of Peer-Mediated Sessions**

Data collected as results of the peer-mediated joint attention intervention aimed to answer the research question, "Is there a functional relation between increased peer use of IJA strategies and increased frequency of target child response to joint attention to peer bids?" To answer this question, data were collected for two concurrent multiple baseline designs across dyads. The first multiple baseline included four dyads and the second included three. Figures 6 and 7 illustrate the results of the peer-mediated intervention.

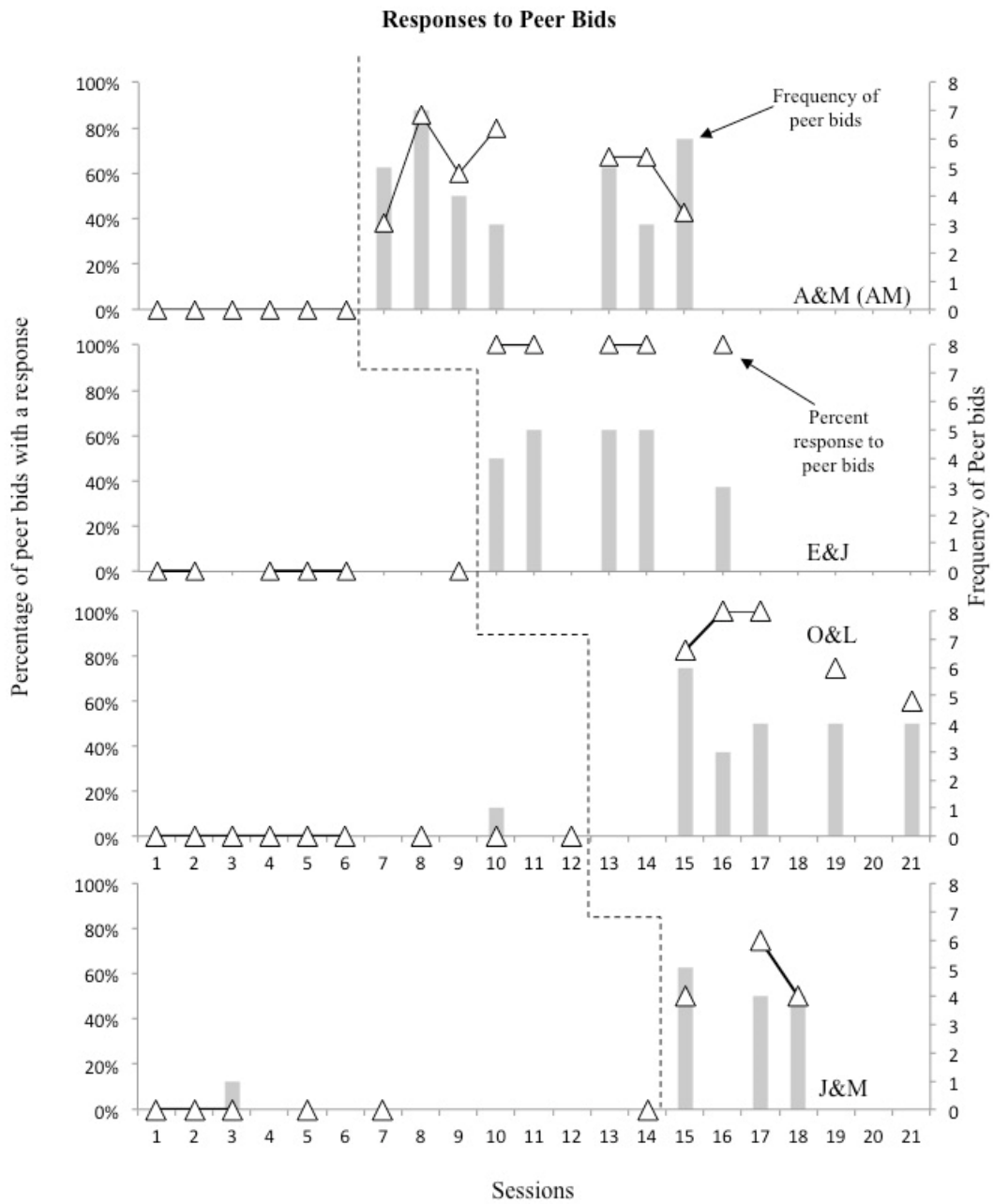


Figure 6. Target Child response to peer bids for Arthur, Emily, Oliver, and Jason.

**Figure 6**

Sufficient data was collected to illustrate three demonstrations of an effect that

meet What Works Clearinghouse standards for single-case research and one demonstration that met with reservations (What Works Clearinghouse, 2012). Vertical analysis indicates no change in baseline data concurrent with intervention data in other tiers. Weighted, averaged tau-U across tiers was 1.0.

**Arthur and Martin.** During baseline, Martin provided no initiations for joint attention. After intervention, Martin provided between three and seven bids for joint attention per session, with an average of five bids per session. Arthur's response to peer data were at zero levels in baseline. Following intervention, an immediate change in level is observed, as well as increasing trend. For this participant, variability in responding correlated with challenging behavior (e.g., refusing, leaving the station). Arthur's mean response to peer bids after intervention was 66.1%, with a range of 38-80%. No overlapping data was evident. Tau-U was calculated at 1.0.

**Emily and John.** During baseline, John provided zero bids for joint attention. Following intervention, John initiated between three and five times per session, with an average of four times per session. Emily's response to peer data was at zero levels in baseline. Following intervention, an immediate change in level was observed, and the data maintained at 100% through the entire intervention. Emily responded to 100% of the bids made by her peer during intervention. Her mean response was 100%. No overlapping data was evident. Tau-U was calculated at 1.0.

**Oliver and Lucas.** During baseline, Lucas provided just one bid for joint attention, which Oliver did not respond to. Following intervention, Lucas made between three and six bids per session with an average of four bids per session. Oliver's response to peer bids data was at zero levels in baseline. Following intervention, an immediate

change in level was observed. Oliver's data had some negative trend at the end of his data. Oliver and his peer had disagreements about the "Hungry hungry hippo" game and this negatively impacted Oliver's interest in responding to his peer's bids. Still, Oliver's mean response to peer bids for joint attention was 84% in intervention, with a range of 60-100%. No overlapping data was observed, and Tau-u for Oliver's data was 1.0.

**Jason & Michael.** During baseline, Michael provided zero bids for joint attention. Following intervention, Michael provided between four and five bids for Jason's attention. Jason's response to peer bids data was at zero levels in baseline. Following intervention, there is an immediacy effect. Although Jason and his peer only had three probes following intervention, Jason's response to peer bids for joint attention appeared to maintain. Jason's average response to peer bids across these three data points was 58.3, with a range of 50-75%. No overlapping data was evident, and Tau-U for Jason's data is 1.0.

### **Figure 7**

Sufficient data were collected to illustrate three demonstrations of an effect that meet what What Works Clearinghouse standards with reservations. Vertical analysis indicates no change in baseline data concurrent with intervention data in other tiers.

Weighted, averaged tau-U across tiers was 1.0.

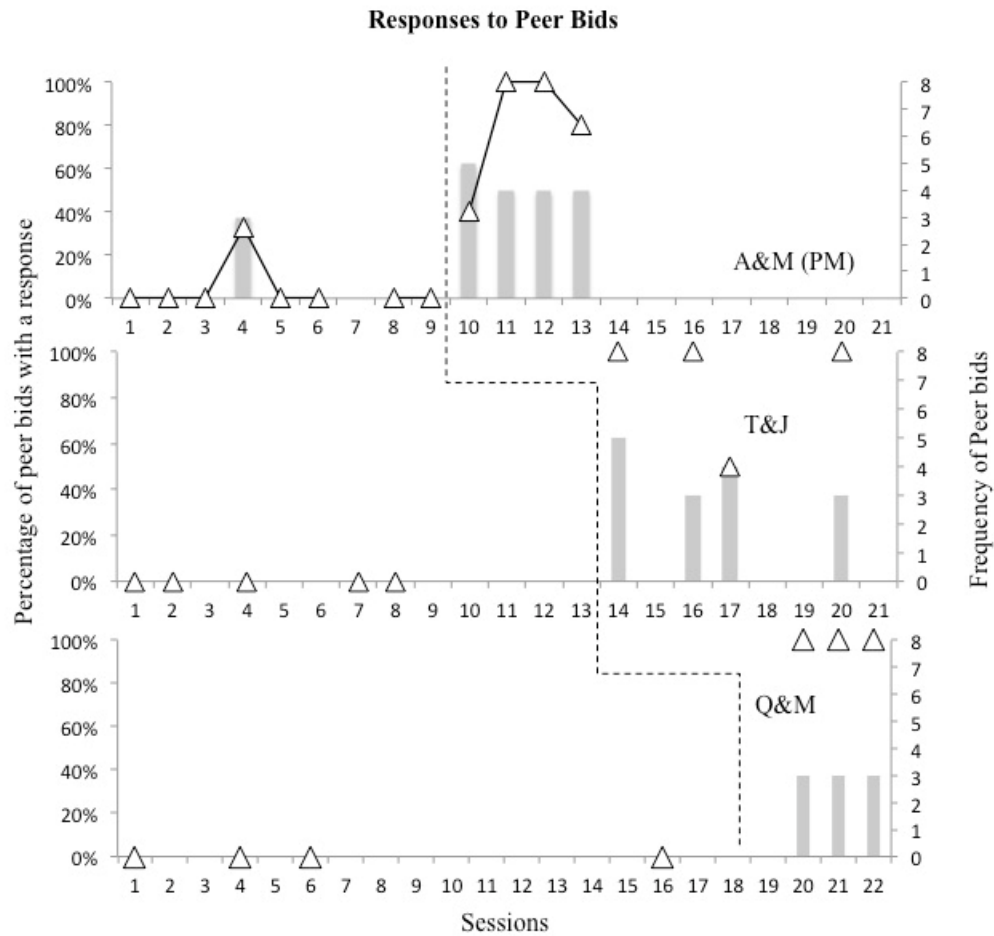


Figure 6. Target child response to peer bids for Aiden, Trevor, and Quinn.

**Aiden and Mario.** During baseline, Mario provided no bids except for during one session where he provided three bids for joint attention, of which Aiden responded to one. Following intervention, Mario provided between four and five bids for joint attention, with an average of four bids per session. Aiden’s response to peer bids were at zero levels in baseline. Following intervention, there was a moderate increase in level, which later increased. After intervention, Aiden’s average response to joint attention was 80%, with a range of 40 to 100%. No overlapping data was observed in Aiden’s



responses to peer bids, and Tau-U was calculated at 1.0.

**Trevor and Jacob.** During baseline, Jacob provided zero bids for joint attention. Following intervention, Jacob provided between three and five bids for joint attention, with an average of three bids per session. Trevor's response to peer bids are at zero levels in baseline. Following intervention, there was a large increase in level. Trevor's data is variable during intervention, with one outlier data point at 44%. Trevor's response to peer bids averaged 88%, with a range of 44-100%. No overlapping data was observed in Trevor's responses to peer bids with a Tau-U of 1.0.

**Quinn and Theo.** During baseline, Theo provided no bids for joint attention. Following intervention, Theo provided three bids per session for three consecutive sessions. Quinn's response to peer bids was at zero levels during baseline. Following intervention, there was an immediate increase in level. All three data points collected after intervention are at 100%. Quinn's data displays no overlapping data and Tau-U is 1.0.

### **Post-hoc analyses of single case data**

Post hoc analyses of single case data were conducted in order to demonstrate a between case effect size. These analyses were conducted using the DHPS Macro. This macro produces Hedges  $g$  (Hedges, 1981), which is comparable to Cohen's  $d$ , but also allows for small sample sizes as is typical in SCRD, and accounts for autocorrelation (i.e., trend or other repeating patterns in baseline that could lead to type I or type II error in interpreting graphs using visual analysis). Results of this analysis indicated an effect size of 3.72 for sessions with the interventionist and 5.32 for sessions with the peer interventionist. Guidelines for the analysis of Cohen's  $d$  indicate a small effect is .2, a

medium effect is .5 and a large effect is .8. Therefore, effect sizes of ( $g = 3.72$ ) and ( $g=5.32$ ) are quite large. Results of this analysis should be interpreted with caution as effect sizes for single case research often document a very large effect and are not sensitive to variations in strong data (Parker, Brossart, & Vannest, 2005). Additionally, these data had zero values in baseline, which can bias this macro's ability to interpret results (Hedges et al., 2015).

### **Pre-Post Engagement Data**

Data were collected on target child engagement once before and once after intervention. Originally, data collection was planned for multiple probes during baseline and intervention but scheduling constraints did not afford this opportunity. Based on the limited pre and post-intervention assessment, it is difficult to draw conclusions from these data. For some children, post intervention engagement is higher, but these findings could be incidental. IOA was calculated on 85% of engagement probes. IOA was 95.3% (range 80-100%). Table 6 shows pre-intervention and post intervention averages for all seven target child participants.

Table 6  
*Engagement averages during 10-second partial interval recording sessions for target children before and after intervention.*

Target Child	Pre-intervention average	Post-intervention average	Setting
Oliver	8.3%	36.6%	Outside time Book Look
Emily	5.0%	--	Outside time
Arthur	5.0%	30.0%	Free play
Aiden	40%	6.7%	Free play
Trevor	65%	56%	Free play

Jason	23.0%	21.0%	Snack time Free play
Quinn	5%	16%	Snack time Free play

*Note.* Data were not collected post intervention for the participant “Emily” because of absences.

### **Pre-post Analyses of ESCS Results.**

Paired sample t-tests were run to examine if there was a significant difference between pre and post scores on the ESCS. Specifically, two paired sample t-tests were run, using SPSS 22 software (Mullen & Mullen, 1995). First, composite scores before intervention were compared to composite scores across domains for post intervention. There was not a significant difference in the composite scores before intervention ( $M = 22.7$ ,  $SD = 13.54$ ), and after intervention ( $M = 35.58$ ,  $SD = 20.52$ );  $t(6) = -1.52$ ,  $p = .17$ . A second paired sample t-test was run to see if there was a significant difference in scores on the joint attention subscale before and after intervention. A paired samples t-test was conducted to compare response to joint attention scores before and after intervention. There was a significant difference in the response to joint attention scores before ( $M = 0.37$ ,  $SD = .19$ ) and after intervention ( $M = 0.97$ ,  $SD = 0.04$ );  $t(6) = -8.47$ ,  $p < .001$ . It is of note that the ESCS reports normal scores for typically developing infants as ( $M = 0.65$ ,  $SD = 0.29$ ).

### **Social Validity Results**

Teacher report of the acceptability and feasibility and overall effectiveness of this intervention were generally high. The average response on a 1-5 Likert scale, with 1 being least acceptable and 5 being most acceptable was 4.22 (range 2 - 5) across all 17 items for all four classrooms participating in this study. By classroom, classroom A

responding with an average of 4.23 (range 3 - 5), classroom B 3.82 (range 2 - 5), classroom C 4.94 ( range 4 - 5), and classroom D 3.88 (range 3 - 5). Overall, the highest scored items were “How acceptable did you find this intervention?” with a mean of 4.75 (range 4 - 5), “How willing were you to have this joint attention intervention take place in your classroom”, mean 4.75 (range 4 - 5), and “To what extent do you think there might have been disadvantages in following this joint attention intervention?” reverse scored for mean of 4.75 (range 4 - 5; i.e., high score meant few disadvantages).

The lowest recorded scores were for the items “ How much time was needed each day for you to have this joint attention intervention take place in your classroom?”, which was reverse coded for a mean of 3.25 (range 3 - 4), “ How well did this student use the skills learned in this intervention in the classroom?”, mean of 3.75 (range 2 - 5), and “to what extent did this participant become more engaged in the classroom after this intervention?”, mean 3.75 (range 2 - 5).

In the area for further comments, one teacher wrote “It was nice to have these students have more one-on-one time with a special teacher”. Another wrote “ This child is still not playing with others during free play”, and another said “I saw differences during circle time.”

Table 7

*Mean Scores and Ranges by Question for TARF-R*

Question	Mean	Range
1. How acceptable did you find this intervention?	4.75	4-5
2. How willing were you to have this joint attention intervention take place in your classroom?	4.75	4-5
3. To what extent do you think there might have been disadvantages in following this intervention?	1.25	1-2 *

4. How much time was needed each day for you to have this intervention take place in your classroom?	2.0	1-3*
5. How confident are you that the joint attention intervention was effective for this student?	3.75	3-5
6. How likely is this joint attention intervention to make permanent improvements in this student's early social skills?	4.25	3-5
7. How disruptive was this intervention?	1.75	1-3*
8. How much do you like the procedures used in this intervention?	4.25	4-5
9. How willing were you to help carry out this intervention?	4.25	4-5
10. To what extent did you notice undesirable side effects from this intervention?	1.75	1-3*
11. How much discomfort did this student experience during this intervention?	1.50	1-3*
12. How willing would you be to change your routines to continue to incorporate this intervention into your classroom?	4.0	3-5
13. How well did this intervention fit into your existing routine?	4.25	3-5
14. How effective was this intervention at teaching early social skills?	3.75	3-5
15. How well did the goal of the intervention fit your goals for this student?	4.75	4-5
16. How well did this student use the skills learned in this intervention in the classroom?	3.75	2-5
17. To what extent did this participant become more engaged in the classroom after this intervention?	3.75	2-5

*Note.* \* Item is reverse scored where a low score is desirable.

### **Procedural and Treatment Fidelity**

**Interventionist procedural fidelity.** Interventionist procedural fidelity was gathered for 100% of sessions by an independent observer. During baseline, interventionist procedural fidelity was collected using a nine-item task fidelity checklist. Baseline interventionist treatment fidelity was an average of 97.3% across all participants (range 88 - 100%). During intervention, interventionist procedural fidelity was collected using a ten-item task fidelity checklist. Interventionist procedural fidelity for intervention with the target child was 98.85% (range 88 - 100%). Interventionist procedural fidelity for peer training using the social narrative was 100%.

**Peer interventionist treatment fidelity.** During baseline, all participants scored 16.7 % on the treatment fidelity checklist for all sessions (i.e., the peer participants did not receive any points on the six item task fidelity checklist except for the item “ peer remains in the play area”). During intervention, peer participants had an overall average of 79.8%. Participant treatment fidelity and ranges are included in Table 8.

Table 8

*Peer interventionist treatment fidelity mean and range in baseline and treatment.*

Peer Interventionist	Target child	Baseline		Intervention	
		Mean	Range	Mean	Range
Lucas	Oliver	16.6%	---	98.6%	96-100%
John	Emily	16.6%	---	74.3%	50-100%
Martin	Arthur	16.6%	---	72.3%	50-83%
Mario	Aiden	16.6%	---	88.6%	83-100%
Jacob	Trevor	16.6%	---	88.6%	83-100%
Michael	Jason	16.6%	---	78.0%	67-100%
Theo	Quinn	16.6%	---	58.5%	50-67%

### **Inter-observer agreement**

For five of the seven participants, IOA was collected from videos by a second independent trained observer. Both parents of the target children in classroom B did not provide consent for videos. For that reason, IOA was conducted on those children’s data in vivo by a second independent observer. IOA was calculated point by point for 57% of baseline sessions. IOA was 87.5% (range 75-100) during baseline. IOA was calculated

for 35.4% of intervention sessions. IOA was 96.0% for these sessions.

## CHAPTER V

### DISCUSSION

Findings of the current study are interpreted in this chapter. First, the purpose and methods of this study are summarized. Next, an interpretation of the results of the research questions is addressed. Finally, implications for research, practice, limitations of the current study, and future research are discussed.

A growing body of literature provides unequivocal evidence that participation in quality early childhood education has benefits that are persistent and far-reaching (Arteaga, Humpage, Reynolds & Temple, 2014; Barnett & Hustedt, 2003; Heckman, 2011). Children who have early opportunities to engage in early social and learning environments with same-aged peers have higher achievement in school (e.g., Nix, Bierman, Domitrovich, & Gill, 2013), on cognitive tasks (e.g., Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, Kagen, & Yazejian, 2001), and with social relationships (e.g., Peisner-Feinberg et al., 2001). For children with special needs, these early opportunities may be even more critical (Odom, Buysse, & Soukakou, 2011). Further, young children with special needs need more careful planning to enjoy the benefits of preschool with their peers (Dunlap, Barton, Smith, & Yeung, 2015).

For children with ASD, core diagnostic criteria such as impaired communication, rigid and repetitive behaviors and interests, and comorbid challenging behaviors can provide significant barriers to useful inclusion in early childhood settings. Although there may be benefits of inclusive settings for children with ASD (e.g., peer models, opportunity for social interaction with same aged peers), without targeted intervention, these children may not fully benefit from these settings (Hansen et al., 2014). Myriad



social communication interventions for children with autism exist; however, there is a need for examination of evidence-based practices within the context of inclusive preschool classrooms.

Peer mediated intervention shows promise for children with ASD. According to What Works Clearinghouse, peer-mediated intervention or peer-mediated learning is classified as an evidence-based practice for language and math instruction and a range of skills for children with intellectual disability. Evidence is being gathered to determine whether peer-mediated intervention is as effective for young children with ASD as for older children with intellectual disabilities and for social communication targets rather than academic targets. Two recent literature reviews have examined the utility of peer-mediated intervention across the age range (Watkins, O'Reilly, Kuhn, Gevarter, Lancioni, Sigafos & Lang, 2015; Boudreau, Corkum, Meko, & Smith, 2015). Although these reviews found many successful studies, few comprehensive peer mediated interventions have been conducted in preschools. The evidence that can be gathered from the existing literature in inclusive preschool classrooms only serves to establish the need for more systematic research on the use of peers as interventionists in the inclusive preschool setting.

Compared to other social communication targets, there is little research on joint attention, especially in the natural setting. For a child who is typically developing, joint attention is fluent by the age of 8-10 months and is learned in the context of everyday interactions with their primary caregiver (Mundy et al., 2003). In contrast, for children with ASD, this skill is often still not present by preschool-age. Within early childhood settings, the natural partner for joint attention interactions is the child's peer. Joint

attention becomes critical for play, social skills, and communication with peers. Imagine, for example, two children playing with Legos™ and one child builds a tall tower and says, “Look at that”. The second child needs the skill of joint attention in order to shift his/her gaze toward the tower and then back to the peer, allowing for a reciprocal play interaction or conversation about the Legos™.

There is a critical need to embed intervention on joint attention into early childhood education classroom environment, as this skill is requisite for more advanced social communication skills including turn taking, play, modeling, and conversational language. Thus, joint attention can be considered a behavioral cusp for the valuable social communication skills often learned and fostered during the preschool years. The current intervention aims to address the gap in the literature on joint attention in natural settings by assessing the ability of preschoolers to facilitate joint attention with their peers with ASD following an adult implemented response to joint attention intervention.

Participants were recruited from reverse inclusion classrooms contracted under an early intervention agency serving the county in the Pacific Northwest region of the United States. Children from four different classrooms participated. Each target child was paired with a different typically developing peer. Following baseline, target children received intervention from the interventionist. Intervention involved use of naturalistic teaching strategies, two systematic prompting hierarchies, and programmed reinforcement. Additionally, peers were primed to initiate joint attention bids to the target child using a social story that included strategies (e.g., pointing to an object, saying “Look!”) and an embedded brief role-play with the interventionist. Data were collected on target child response to interventionist bids, peer treatment fidelity, and target child

response to peer bids. Additionally, data were collected on teacher perceptions of utility, acceptability, and feasibility of this intervention.

### **Summary of Main Findings**

#### **Is There a Functional Relation Between Use of a Joint Attention Intervention and an Increase in the Level of Response to Joint Attention Behaviors to Interventionist Bids in Young Children with ASD?**

Results indicated that there was a strong functional relation between interventionist use of a packaged intervention consisting of naturalistic teaching and discrete trial training strategies and increased level of response to joint attention behaviors in young children with or at risk for ASD. All seven target child participants demonstrated a change in level and or trend upon implementation of the intervention, and this effect maintained throughout the intervention phase. For most participants, reoccurring sessions allowed for the fading of prompts and increased level of independent responding. In the first multiple baseline, this functional relation was achieved by four demonstrations of a basic effect across four different points in time. In the second multiple baseline, this was demonstrated by three demonstrations of a basic effect across three different points in time.

#### **Is There a Functional Relation Between Training of Peers to Initiate Joint Attention and Increased Frequency of Bids to Target Children?**

Data indicated that joint attention initiations in baseline from typically developing peers were at near zero levels. During baseline, only two of the peer interventionists delivered any bids for joint attention. None of these bids received a response from the target child. Following intervention, peer bids ranged from two to seven bids per session.

Peer treatment fidelity also increased following intervention. Data indicate a strong functional relation between the peer training and an increase in prompts to target children for joint attention. Peers successfully attended to the social story, remained in the play area, and provided a minimum of three bids for most sessions during most sessions. Overall peer treatment fidelity was 76%.

### **Is There a Functional Relation Between Increased Peer use of IJA Strategies and increased Frequency of Target Child Response To Joint Attention to Peer Bids?**

Data indicated there was a functional relation between increased peer use of IJA strategies and increased frequency of target child RJA response to peer bids. All participants showed an immediate change in level, and all but two showed an increasing trend. The first multiple baseline showed four demonstrations of a medium effect and the second multiple baseline showed three medium effects. As peer bids increased, so did target child bids.

### **Does Intervening On Response to Joint Attention Behaviors Influence Overall Levels Of Engagement Between a Child With Autism and their Peers?**

Insufficient data were collected to answer this research question experimentally. For some children, the mean response after intervention was higher than the mean response prior to intervention, but for some children their overall engagement was higher before intervention. Repeated measures would have allowed for more observations and would have been less sensitive to variability. Replications of the current study should take this data on a probe basis.

### **What are Teacher Perceptions of The Feasibility and Acceptability of the Goals, Procedures and Intervention Outcomes?**

A majority of teachers responded favorably to this intervention. Teachers appreciated the extra intervention time for the children. Several teachers anecdotally noted generalization of both target child responses and peer responses to other classroom activities. For example, one teacher reported improved attending behaviors at circle by the target child (e.g., singing a song with peers during circle). Several teachers reported not being aware of the intervention procedures, or not being able to observe intervention procedures as shortcomings of the intervention.

### **Implications for Practice**

Early social communication skills, comprised of early social communication skills such as social referencing, social orienting, joint attention, and joint referencing, are behavioral cusps for later social communication skills (DeQuinzio, Poulson, Townsend, & Taylor, 2016). Despite their pivotal nature, assessment of these skills decreases after the toddler years in lieu of more advanced social communication skills including taking turns or developing play skills (White et al., 2006). Early childhood generalists and special education practitioners should consider including screening for joint attention and other early social communication skills even if other more advanced social skills appear to be in place. As joint attention is a requisite skill for many other skills, failing to screen and intervene may increase the risk of more advanced social skills to become rote or rigid. A large proportion of preschool-aged children with ASD have not yet developed complete joint attention (Mundy et al., 2015), and research indicates that joint attention skills acquired earlier on are significantly predictive of later preschool success. Early intervention on joint attention may be critical for increased learning in early childhood settings.

This intervention utilized a model of service provision with targeted “pull-out” sessions followed by direct generalization probes in the classroom. This model is frequently used for speech-language therapies and applied behavior analytic instruction, (Ledford, Barton, Hardy, Elam, Seabolt, Shanks, Hemmeter, & Kaiser, 2016). Results of this study indicate that this may be an effective way to teach or “prime” early and pivotal social communication skills, which are not often accessed in this manner. Early and pivotal social communication skills are often taught in the context of increasing quantity and quality of interactions, but there is precedent in the current literature for more targeted intervention on behavioral components of these composite skills (Taylor & Hoch, 2008; Hansen et al., *under review*). One potential limitation of this priming procedure is its separation from the natural learning environment and need for additional teaching staff and/or service providers. Practitioners should program for generalization of early and pivotal social skills to the classroom setting and peers at the onset. Examples of this include strategies such as encouraging multiple peers to provide initiations, providing multiple cues for joint attention (e.g., “Look at that!”, “I see a blue light”, “Wow! Look!”), and efficiently fading prompts.

The current intervention was a low-dose, low intensity intervention. Children received between one to three hours of intervention per week. Despite the small amount of time required, these participants acquired and generalized the targeted skills to the classroom. This finding may speak to the utility of low dose interventions on early and pivotal social communication skills. Brief interventions on pivotal skills that unlock later social functioning and communication may be of benefit for classroom settings, and there is evidence to suggest that intervention on these skills may speed up acquisition of more

complex skills later on (Gulsrud, Helleman, & Freeman, 2014). While the current study was a packaged intervention, it involved strategies that may have some independent benefits. Teacher-led instruction with a social narrative about “showing our friends new things,” during circle, for example, may facilitate increases in the frequency of bids initiated by peers in the classroom. Strategies extracted from this intervention could be beneficial to early childhood general and special education settings.

Furthermore, findings of this study have implications for practitioner use of strategies and implementation of peer-mediated strategies in inclusive classroom settings. In terms of generalization and maintenance of social communication skills, use of peers as interventionists and/or involving peers in intervention shows promise (i.e., Watkins, O’Reilly, Kuhn, & Gevarter, 2015). Peers are uniquely able to intervene on and reinforce behaviors that are socially valid (McFadden, Kamps, Heitzman-Powell, 2014). Friendships and peer networks begin to develop in preschool, and adults may not be privy to idiosyncrasies of the classroom environment (Slaughter, Imuta, & Peterson, 2015). For classrooms providing services in multiple domains for multiple children, training peers to teach skills like joint attention can increase intervention dosage for target children by providing more opportunities to respond (Lane & Lieberman-Betz, 2015).

Finally, there is reason to believe that failure of peers to initiate joint attention to children with ASD, as seen in baseline in this study, could be a result of learning history. From a behavior-analytic perspective, the presence of an interesting event or object could serve as both a discriminative stimulus and a motivating operation for gaze shifting or initiation of joint attention behavior (Dube et al., 2004). Thus, the reinforcement available for the initiation of joint attention is often a subsequent gaze shift or comment from

another individual, or in the case of preschoolers, a possible play exchange. It may be that children with ASD who have not been supported to learn to respond to joint attention bids are failing to respond consistently, causing insufficient available reinforcement for their peers to continue making bids. Over time, failure to respond may extinguish joint attention initiation from peers; thus, the bids are not sustained. In other words, the child with ASD fails to reinforce their peer's bids, and an extinction effect may be at play. Reinforcing peer attempts to make bids to target children may be sufficient to increase overall bids from peers to children with ASD.

### **Implications for Research**

Early social communication skills are prerequisite skills for more advanced skills, symbolic play, and pragmatics (Mundy et al., 2003). As noted in chapter two, despite the large number of children with ASD who have not yet mastered these early and pivotal skills after the toddler years (e.g., Landa, Gross, Stuart, & Faherty, 2013), and the importance of these skills later on (Freeman, Gulsrud, & Kasari, 2014), early and pivotal social communication skills are under-represented in the literature on behavioral interventions for young children with ASD and other developmental disabilities. Instead, research is focused on skills emerging later in the developmental progression and composite early social communication skills (e.g., symbolic play and joint attention; Kasari et al., 2013). A growing body of research establishes the need to intervene on early and pivotal social communication skills if not acquired early in development.

A preponderance of evidence exists to support joint attention as a predictor of later success across domains (e.g., Vaughan Van Hecke, Mundy, Acra, Block, Delgado, Parlade, Meyer, Neal, & Pomares, 2007; Sheinkopf, Mundy, & Claussen, 2004; Dawson,



Toth, & Abott, 2004; Charman, 2003). One study, for example, found that levels of joint attention in infancy predicted language development at a one-year follow up better than other observational measures or a nonverbal test of intelligence (Charman, Baron-Cohen, Swettenham, Baird, Drew, & Cox, 2002). Another study found that joint attention skill at 12 months was predictive of social functioning at 30 months, even when controlling for other variables that may impact social functioning (e.g., externalizing behaviors). Authors of that study noted that joint attention was a robust predictor of later typical development across domains (Van Heck et al., 2007). Finally, in a 2004 paper, authors used the ESCS, as used in this study, to see if scores on the joint attention subdomain predicted behavioral functioning in preschools. Results indicate that initiations of joint attention predicted lower levels of disruptive behavior and withdrawn behavior and higher levels of social competence. This paper also found that higher levels of functioning on the behavioral request subdomain of this assessment (e.g., child gestures for a turn with a toy) were not predictive of better functioning later on (Sheinkopf, 2004). This finding reinforces the importance of separating instruction on joint attention from mand training or compliance.

Despite the evident importance of early social communication skills, there is little research examining these skills compared to other social communication targets (White et al., 2013). Within the body of literature on joint attention, there is greater need to precisely define joint attention. According to the topography of response to joint attention behaviors named by some definitions, several of the children who participated in the current study already had joint attention during baseline. Several participants responded to a majority of the interventionist's requests to "Look at that" by shifting their gaze to

the object in question. Without the social component of then shifting their attention back to the interventionist, however, this skill becomes more about compliance with a request, or following a one-step direction. In other words, the interventionist may have had similar rates of response from a different discriminative stimulus (e.g., “Touch your head”). During baseline, simple compliance with a request was not sufficient to complete the entire triadic joint attention intervention. Sustained over time, this pattern of responding may mean a lack of prerequisite skills for learning in social communication domains typical to a preschool experience.

While the function both of initiating and responding to joint attention is fairly clear for children who are typically developing, the function of gaze shifting toward an object and then back toward an individual may not be the same in children with ASD. During this intervention, the interventionist-mediated sessions showed a clear increase in response to joint attention behaviors. Still, we are unable to determine whether or not these behaviors are maintained by a social function (i.e., reinforced by social interaction social praise from the interventionist), or whether the contingent delivery of a tangible (i.e., edible) paired with descriptive praise following RJA behavior maintained responding. Similarly, for a child who was typically developing, research indicates that joint attention behaviors would be maintained by social interaction with their peer (e.g., if the peer said, “Look at my lego tower”, the child would look and receive social reinforcement from helping to make the tower taller); however, it is unclear what the operant function is for RJA behaviors of children with ASD.

In a previous study completed using a similar intervention protocol (Hansen et al., *under review*), children did not receive a preferred edible contingent on RJA behaviors in

order to ensure that gains from this intervention were more readily generalized to natural settings (i.e., that only ecologically-valid descriptive praise maintained the response to joint attention behavior). For example, for a child who is typically developing, a parent is unlikely to direct the child's attention to a duck they notice in the park and then say, "Wow! Good looking!" Further, it would be even more unlikely for that parent to also deliver a preferred edible or item. Instead, typical joint attention is subtle, natural, and in many cases, invisible to the untrained eye. In the body of joint attention literature presented in chapter one, it is clear that this question of programming for generalization of joint attention skills in young children with ASD is, as of yet, untapped. Across 23 studies reviewed in this manuscript, only ten used a natural change agent (e.g., parent, sibling, teacher) and/or intervened in a natural setting (e.g., classroom, home), and only four used natural change agents in the natural setting. The current study attempted to address this gap by assessing stimulus control transfer of RJA behavior acquired with the PI to trained peers within the preschool classroom. While some methodological flaws precluded the complete assessment of this transfer (e.g., the interventionist was always present and could have served as a discriminative stimulus for joint attention and peers did not provide bids for joint attention during baseline), these findings do suggest that priming of joint attention skills may facilitate generalized responding to the classroom setting with natural change agents.

The use of peers as natural change agents makes this study novel given the small body of related literature. Peers are a logical choice as interventionists on social communication skills and may provide increased opportunities for intervention because of the time spent with peers in the preschool classroom. Despite the social and ecological

validity of using peers as interventionists, the existing body of literature on peer interventionists for this age group is varied in efficacy and rigor. One methodological shortcoming in the literature on peer-mediated intervention for very young children is the lack of data collection on peer treatment fidelity. Without an understanding of the fidelity of peer-mediated interventions, it is difficult to interpret results in terms of the efficacy. A recent literature review on peer mediated interventions for children with ASD found that there was a dearth in data-based interventions using rigorous assessments in this body of literature, including the use of treatment fidelity for peer interventionists (Huber & Carter, 2015). Providing feedback on treatment fidelity proves potentially more difficult with young children, and future research should consider simplified self-monitoring to ensure consistency. Interestingly, the peer participant with the lowest mean treatment fidelity (Martin) corresponded with the target child with the lowest mean response to peer bids (Arthur). Further analysis of peer fidelity checklist components would be useful to identify critical features of the peer intervention.

### **Limitations and Future Directions**

This current study had several limitations. Primarily, as with any single study, the external validity is limited. This study was conducted in classrooms that were similar to each other in curriculum and daily routine, and thus, these procedures may not have the same utility in different classrooms. Additionally, while this intervention appeared to be effective for all participants, the degree to which the effects of the intervention changed and continued to change participant behavior varied considerably. This speaks to the need to replicate these findings with a larger body of participants. These results also seem to vary dependent on ASD severity and diagnosis. For example, “Arthur”, who did not have

an ASD diagnosis, showed a small change in level following intervention but a dramatically increasing trend where participants with diagnoses had shown a dramatic shift in level but slowing increasing trend. Further, children who scored in the severe range on the CARS-R showed slower acquisition of response to joint attention skills with the interventionist. These results could point to the impact of skill deficits versus performance deficits for children with or without an autism diagnosis. Future research may benefit from comparisons across groups of more homogeneous symptom severity.

Secondly, while this intervention assessed stimulus control transfer of a response to joint attention behavior from one-on-one sessions with the interventionist in a controlled environment to the classroom context with a peer participant, participation with peers in the classroom was still highly controlled (i.e., took place in a particular part of the classroom, involved one peer, usually centered around one activity). Feedback from classroom teachers included that they would prefer future interventions were more integrated into the activities of the classroom (e.g., involved more than one peer or situated the dyad in a whole-class activity). The failure to collect sufficient peer engagement data did not allow for a thorough examination of whether this intervention changed target child behavior in other contexts or whether gains only persisted in that one particular “joint attention center.”

Further limitation comes from the presence of the interventionist. Because the interventionist was constant between the outside sessions with the target child and the “push in” sessions with the peer, there is no evidence in this study that the gains noted in both settings were not influenced by the presence of the interventionist (i.e., the interventionist served as a discriminative stimulus for target child and peer behavior).

Ability to speak to the functional relation of the peer data to the target child data is further impaired by the lack of peer bids in baseline. Because some participants never received a bid from their peer in baseline, it is possible that they would have responded similarly to a peer bid as they did in intervention. Future research should stagger introduction of the joint attention intervention to observe the effect of peer initiations alone.

Additionally, anecdotally, increased skills were observed in other areas not documented by the data collected. For example, increased target child modeling of peer play skills was observed as well as more engaged play than during baseline (e.g., more turn taking, more language or play exchanges). During baseline, despite repeated opportunities to interact, few play exchanges were observed between the target child and peer. Future research should include a quality of play scale, in order to assess whether increase of target child attention to peer increases the target child's ability to model peer skills. Further, initiations of joint attention from the target child were observed following intervention for almost all participants; however, data collection did not allow for the examination of this skill. Future research should examine the effect of modeling initiation of joint attention for the target child on later delayed imitation of that skill to the peer. Future studies may consider packaging initiations and responses to joint attention and measuring gains on both skills.

The current study is unique in its examination of both response to joint attention in a classroom environment and its involvement of peer participants in intervention. Because of this, replication with modifications would be highly helpful for drawing more conclusive implications from this research. More research is needed on the various

components of this intervention, and aspects like peer treatment fidelity, classroom activity choice, and interventionist role should be further examined.

Because of the relative lack of research in this area compared with other intervention targets for young children with ASD, joint attention and other early and pivotal social communication targets are an area with many opportunities for future research. For example, Dequinizio and colleagues (2016) call for more research on social referencing, a composite skill of joint attention and other early social factors. The definition and delineation of these early and pivotal skills would be especially useful for evaluation of interventions to promote early social skills. Further, the vast majority of the literature uses the Early Social Communication Scales as a tool to measure joint attention and social referencing skill. While this tool is valuable for these purposes, it is aligned with intervention from a cognitive and developmental framework and may not have the precision necessary for behavior analytic intervention on component skills. An assessment that included function-based analysis of joint attention and other early social communication targets may be more useful. Additionally, tools like the ESCS are meant to assess a younger aged child and may not screen for a topography of joint attention appropriate for a preschool aged child.

The role of reinforcement is also an area of interest for future research. If we assume the motivating operation that's typically at play during joint attention is absent for children with ASD (i.e., the value of the adult social reinforcement and rate of child joint attention is not temporarily increased by the interesting event), then it might be necessary to pair delivery of adult social attention with additional primary or secondary reinforcers. In a previous study (Hansen et al., *under review*), joint attention was successfully taught

only with contingent descriptive praise, but the gains were considerably smaller than those observed in the present study. While some of this variance could be due to the use of parent interventionists who might have been considerably less precise than a trained interventionist, the joint attention skill was still acquired more quickly with a tangible putative reinforcer. The high rate of response to peer bids observed in this study is also of interest, as some ratio strain was expected because a tangible reinforcer was not administered for correct response to a peer bid. Rapid thinning of the reinforcement schedule can sometimes lead to a dramatic reduction in responding, but in this case responding increased (Cooper, Heward, William, Cooper, Heron, & Heward, 2007). This finding may indicate that the social reinforcement available from peers was preferred to adult social praise. Future research should examine conditioning of social interaction as a reinforcer.

Future research is also needed to address barriers to measuring the generalization of learned joint attention skills. One such barrier was the presence of the interventionist during both “pull out” and “push in” sessions. Future research should consider training teachers or teacher assistants to prompt peers to initiate joint attention to alleviate the concern that the interventionist was the true discriminative stimulus for response to joint attention behaviors. Additionally, due to the design of this study and the lack of independent bids from peers for joint attention during baseline, there is a need to assess the utility of the priming sessions, as well as the latency to the generalization session from the priming sessions. Future research should consider a counter-balanced design to investigate whether or not training peers on initiation of joint attention is sufficient to increase target child responses to peer bids. Future replications of this study should also



include data collection on target child initiations of joint attention, as well as more detailed peer treatment fidelity to better address the functional relation between peer behavior and target child response.

Finally, because the literature so clearly illustrates that joint attention is a pivotal social communication skill necessary for improved social functioning, and this study indicates there is promise for use of this intervention in preschool settings, more research on the immediate impact of teaching this skill on other social communication skills is of interest. Future research may examine a comparison between a targeted joint attention intervention and a packaged social communication intervention with more global targets to inform the sequence of social communication development and the proximal impact of instruction on a pivotal skill on later developmental skills.

### **Conclusion**

The current study illustrated the effect of a peer-mediated intervention on joint attention. There is little available research on joint attention and of that research few studies examine joint attention in natural settings and with natural change agents. This study used brief priming sessions with an interventionist who used naturalistic instruction and discrete trial training components to teach response to joint attention, followed by generalization probes with peers to examine whether joint attention could be a) taught and b) generalized to the classroom environment. Results indicated that target children learned joint attention behaviors with the interventionist and they also showed an increase in response to peer bids. Future research should examine the various components of this intervention in greater detail, such as the effect of peer-training alone, or a class wide intervention on initiation and response to peer bids.

APPENDIX A

CHILD DATA SHEETS

Date	Bid from Interventionist						Target Behavior (Child to stimuli)			Initiation				Target behavior (Child to interventionist)		
	Gaze shift towards item with	Gaze shift verbal description and	Verbal description w/o gaze shift	Gesture w/o verbalization	Partial physical	Full physical.	Gaze shift	Head turn	Body reorient	comments on object	waves or otherwise directs attention to themselves	Partial physical	Full physical (interrupts line of sight)	Gaze shift	Head turn	Body reorient
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

**Gaze Shift:** Child changes gaze so that object or interventionist is within view and remains in view for at least 2 seconds.

**Head Turn:** Child moves head at least 30 degrees or until object or interventionist is within view and stays within view for 2 seconds.

**Body Reorient:** Child moves body towards object or interventionist 2 ft or until object or interventionist is within view.

Participant Code:  
Data Collector:

Session #:  
Primary or IOA

	Initiation (Peer to Child)						Target Behavior (Child to stimuli)			Response (Peer and Child)			
	Gaze shift towards item with verbal description	Gaze shift verbal description and gesture	Verbal description w/o gaze shift	Gesture w/o verbalization	Show Item	Lead to Item	Gaze shift	Head turn	Body reorient	comments on object	Verbal Exchange	Play exchange	No further interaction
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

**Peer Behaviors**

**Gaze Shift w/verbal description:** Peer shifts gaze to object and comments on object. Peer might say “ Look a blue light!”.

**Gaze Shift w/verbal description & gesture:** Peer shifts gaze to object and comments on object, adding gesture such as point or wave.

**Show Item:** Peer removes item from shelf or table and brings closer to target child.

**Lead to Item:** Physically directs peer towards object by pulling hand or pushing towards object.

**Target child Behaviors**

**Gaze Shift:** Child changes gaze so that object or interventionist is within view and remains in view for at least 2 seconds.

**Head Turn:** Child moves head at least 30 degrees or until object or interventionist is within view and stays within view for 2 seconds.

**Body Reorient:** Child moves body towards object or interventionist 2 ft or until object or interventionist is within view.

### Partial Interval Data Form

**Participant Code:**

**Date:**

**Start time:**

**Data Collector:**

**Stop time:**

**Behavior definition:** Engagement is defined as the target child being in close proximity to a peer (i.e., within two feet), playing with the same materials as a peer (e.g., both playing legos), exchanging materials or turn taking with peer, exchanging verbal communication with a peer and or looking directly at a peer.

Minute	10 Second Intervals					
	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

**Pivotal Play Joint Attention Interventionist Task Fidelity  
Peer Training**

Session #: \_\_\_\_\_  
\_\_\_\_\_

Date:

Participant \_\_\_\_\_  
\_\_\_\_\_

D.C.:

P Y/N

**Goal:** Using a social story, role-play, and modeling, the interventionist will instruct the peer participant on how to initiate joint attention with the target child.

<b>Interventionist Behavior</b>		
1.	Interventionist reads social story with peer participant	Y N
2.	Interventionist models initiation of joint attention	Y N
3.	Interventionist role-plays with peer participant with feedback.	Y N
4.	Interventionist uses social or tangible reinforcer after peer participant participates in training.	Y N
5.	During the play session, interventionist provides prompts for peer to initiate a joint attention bid.	Y N
<b>TF Score = correct/total steps attempted or with an opportunity</b>		_____ %

APPENDIX B

TREATMENT FIDELITY CHECKLISTS

**Pivotal Play Joint Attention Interventionist Task Fidelity  
Baseline**

Session #: \_\_\_\_\_  
\_\_\_\_\_

Date:

Participant \_\_\_\_\_  
\_\_\_\_\_

D.C.:

P Y/N

**Goal:** Interventionist will provide a minimum of five bids for joint attention during a 10 minute period. Interventionist will provide a minimum of 1 bid per 2-minute interval. Interventionist will not provide prompts for joint attention. Interventionist will not teach including incidental teaching or language expansions.

<b>Interventionist Behavior- with target child</b>		
1.	Interventionist engages child in activity	Y N
2.	Interventionist provides reinforcer for compliance (e.g., stays at table) as needed	Y N
3.	Interventionist provides at least one bid for joint attention every 2 minutes	Y N
4.	Interventionist does not prompt joint attention response	Y N
5.	If the child does get a joint attention response correct, interventionist does not provide social or tangible SR+	Y N
<b>Interventionist Behavior- with Dyad</b>		
6.	Interventionist keeps children at the JA station	Y N
7.	Interventionist only provides praise or SR+ for compliance or noncontingently	Y N
8.	Interventionist manages challenging behavior and materials	Y N
9.	Interventionist does not model or initiate joint attention bids	Y N
<b>TF Score = correct/total steps attempted or with an opportunity</b>		_____ %

**Pivotal Play Joint Attention Interventionist Task Fidelity  
Target Child Intervention**

Session #: \_\_\_\_\_  
\_\_\_\_\_

Date:

Participant \_\_\_\_\_  
\_\_\_\_\_

D.C.:

P      Y/N

**Goal:** The goal is for the interventionist to direct the child’s attention to one of five objects (i.e., staged stimuli and naturally occurring opportunities for JA) a minimum of five times in a 10-minute interval. The interventionist should engage the child in provided play materials between bids. The interventionist should direct child attention to a different object per 2 minute interval.

	<b>Interventionist Behavior</b>	
1.	Interventionist remains face to face with child whenever possible.	Y   N
2.	Interventionist follows child lead and participates in play with child between bids	Y   N
3.	Interventionist attempts to direct child gaze to stimuli approximately 1 time every 1-2 minutes.	Y   N
4.	Interventionist begins with the least intrusive prompt (Gaze shift with verbal description with or without gesture (e.g., look! That bear has a wig on).	Y   N
5.	If the child does not respond to the least intrusive prompt (eye gaze shift) following time delay, interventionist correctly uses least to most prompting to shift child gaze to stimuli: a) Gaze shift with verbal description and gesture (e.g., point) b) Partial physical with gaze shift, verbal description, and gesture (e.g. taps child on shoulder, points). c) Full physical (physically orients child’s head or body towards stimuli, then points and gives verbal description).	Y   N
6.	Interventionist implements three second time delay between prompts: a) After gaze shift with verbal description b) After verbal description and gesture c) After partial physical	Y   N
7.	Once child shifts gaze towards stimuli, interventionist uses the least intrusive prompt (e.g., comments on object or event) to direct child gaze back to them.	Y   N
8.	If the child does not respond to the least intrusive prompt (e.g., interventionist comments on object or event) interventionist uses least to most prompting to direct child gaze back to parent a) Gestural prompt (e.g., parent waves or directs attention to themselves) b) Partial physical (e.g., parent taps child on shoulder) c) Full physical (e.g., parent positions themselves 5-10 inches from child’s face and interrupts child’s line of regard)	Y   N
9.	Interventionist implements time delay between prompts as needed (3-5 seconds) a) After gesture b) After partial physical c) After full physical	Y   N

10.	Interventionist looks back at object and uses descriptive praise (e.g., yes, that's a silly bear!)	Y N
11.	Interventionist administers tangible or social reinforcer	
	<b>TF Score = correct/total steps attempted or with an opportunity</b>	_____ %



**Pivotal Play Joint Attention Peer Task Fidelity**

Session #: \_\_\_\_\_

Date: \_\_\_\_\_

Participant \_\_\_\_\_

D.C.: \_\_\_\_\_

P Y/N

**Goal:** During a 10-15 minute center rotation at the joint attention center, peer participant will direct target child's attention towards an object or event near play area.

<b>PEER Interventionist Behavior</b>		
1.	Peer participant listens to social story	Y N
2.	Peer participant observes intervention model of initiation of joint attention	Y N
3.	Peer participates in role play with interventionist	Y N
4.	During the intervention session, peer remains in the play area and engages directly with the target child.	Y N
5.	During the intervention session, peer provides sufficient bids for joint attention	Y N
6.	During the play session, peer provides social reinforcement for peer response to joint attention behavior (e.g., "isn't that cool?").	Y N
<b>TF Score = correct/total steps attempted or with an opportunity</b>		_____ %

## APPENDIX C

### JOINT ATTENTION MATERIALS

Rotating sets of stimuli with three items in each set and three possible sets (inside and out):

1. Stuffed animals in outfit/ wigs (x3)



2. Posters of unique images/ wall decorations (i.e., paper fish, jungle animals decorations, lisa frank party decorations)



3. Fiber optic lamp.



4. Globe light



5. Fake jelly fish tank



APPENDIX D

SURVEYS

**Parent Survey**

Will your child look where you point?

Does your child look at you if something surprising happens?

Do they bring you things to show you? (Not just to get help with an object)

What small foods does your child prefer? (e.g goldfish crackers, dried fruit, fruit snacks)

How often does your child see children from school outside of the school day?

Does your child have any favorite classmates?



APPENDIX E

PREFERENCE ASSESSMENT DATA SHEETS

**MSWO DATA SHEET**

Clint Name: H.F.

D.C:

Date:

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>

<b>Session ( )</b>	<b>Item selected</b>	<b>Notes</b>	<b>Order #</b>
<b>Trial 1</b>			
<b>Trial 2</b>			
<b>Trial 3</b>			
<b>Trial 4</b>			
<b>Trial 5</b>			

<b>Session ( )</b>	<b>Item selected</b>	<b>Notes</b>	<b>Order #</b>
<b>Trial 1</b>			
<b>Trial 2</b>			
<b>Trial 3</b>			
<b>Trial 4</b>			
<b>Trial 5</b>			

<b>Session ( )</b>	<b>Item selected</b>	<b>Notes</b>	<b>Order #</b>
<b>Trial 1</b>			
<b>Trial 2</b>			
<b>Trial 3</b>			
<b>Trial 4</b>			
<b>Trial 5</b>			

<b>Session ( )</b>	<b>Item selected</b>	<b>Notes</b>	<b>Order #</b>
<b>Trial 1</b>			
<b>Trial 2</b>			
<b>Trial 3</b>			
<b>Trial 4</b>			
<b>Trial 5</b>			

<b>Session ( )</b>	<b>Item selected</b>	<b>Notes</b>	<b>Order #</b>
<b>Trial 1</b>			
<b>Trial 2</b>			
<b>Trial 3</b>			
<b>Trial 4</b>			
<b>Trial 5</b>			





Not at all disruptive  
Disruptive

Neutral

Very

6. 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. How willing were you to help carry out this intervention?

1                      2                      3                      4                      5

Not at all willing                      Neutral                      Very willing

9. 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

10. How much discomfort did this student experience during this intervention?

1                      2                      3                      4                      5

No discomfort at all                      Neutral                      Very much discomfort

11. How willing would you be to change your routines to continue to incorporate this intervention into everyday classroom routines?

1                      2                      3                      4                      5

Not at all                      Neutral                      Very willing

12. How well will carrying out this joint attention intervention fit into your existing classroom routine?

1                      2                      3                      4                      5

Not at all well                      Neutral                      Very well

13. How effective was the intervention in teaching this student early social skills?

1                      2                      3                      4                      5

Not at all effective                      Neutral                      Very effective

14. How well did the goal of the intervention fit with your goals for this student?

1                      2                      3                      4                      5

Not at all                      Neutral                      Very much

15. How well did this student use the skills learned in this intervention in the classroom?

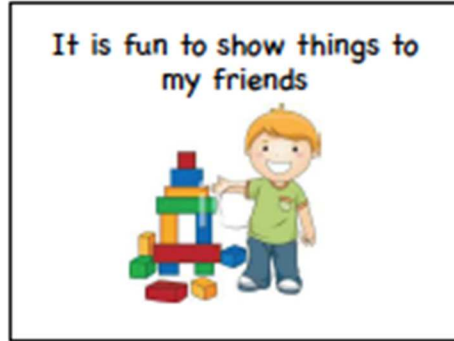
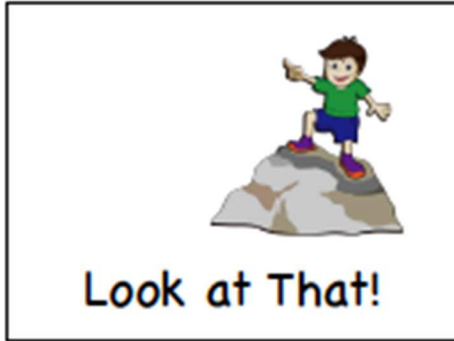
1                      2                      3                      4                      5  
Not at all                      Neutral                      Very much

16. To what extent did this participant become more engaged in the classroom after this intervention?

1                      2                      3                      4                      5  
Not at all                      Neutral                      Very much

Anything to add?

APPENDIX G  
SOCIAL STORY



Then I point and say "look!"



Sometimes they do not hear me and I can try again



Its fun to see new things together!



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