Promoting Interactions in Preschoolers with Autism Spectrum Disorder via Peer-Mediated Intervention.

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy

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Abstract

The purpose of this dissertation is to develop and examine the efficacy of a social skills intervention program that was delivered to preschoolers with Autism Spectrum Disorder (ASD) via typically-developing peers. According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM 5; American Psychiatric Association, 2013), one of the defining characteristics of ASD is a marked impairment in social interaction. Children with ASD often lack the ability to use social cues and frequently fail to develop peer relationships that are appropriate to their developmental level. In this model, a speech language pathologist and three early childhood educators trained typically-developing peers to engage children with ASD in play. Three preschool children with ASD and six peers participated in five social skills training sessions followed by 12 implementation sessions (six sessions for each peer). The peer intervention took place in early childhood classrooms during play sessions with blocks and play dough. A single-subject multiple baseline design across subjects was used to determine the effects of the intervention. All three children
with ASD demonstrated significant gains in the number and length of their interactions with peers, and in their responses and initiations with peers. Gains were maintained over time. In addition, generalization of the skills learnt was measured by collecting data with an untrained peer. The results provided preliminary evidence supporting this model of intervention. Treatment fidelity and social validation measures are documented. Limitations are acknowledged, future research is suggested, and implications are drawn.

Keywords: autism spectrum disorder, peer-mediated intervention, social interaction, preschoolers, single subject design.
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CHAPTER 1
Introduction and Review of the Literature

The purpose of the research described in this dissertation is to develop and examine the effects of a social skills intervention program that was delivered to preschoolers with Autism Spectrum Disorder (ASD) via typically-developing peers. According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013), a defining characteristic of ASD is a marked impairment in social interaction. Children with ASD often lack the ability to use social cues such as eye-gaze, facial expression, and gestures, to regulate social interaction (Adamson, Bakeman, Deckner, & Romski, 2009; Chiang, Soong, Lin, & Rogers, 2008; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Warreyn, Roeyers, & De Groote, 2005). In addition (and probably consequently), children with ASD fail to develop peer relationships that are appropriate to their developmental level (Wolfberg, Bottema-Beutel, & DeWitt, 2012).

This chapter focuses on a review of the literature that forms the background to my research. First, I briefly describe ASD and the deficits in social interaction and communication inherent in this disorder. Second, I review social-cognitive theory, which provides a framework for understanding the development of social skills in young children. Third, I describe the development of social competence in typically-developing children and fourth, I describe the development of social competence in children with ASD. Fifth, I examine the strengths and weaknesses of common intervention methods that aim at promoting communication and social interactions in children with ASD and examine the role of peer-based interventions for
improving social interaction skills in these children. This chapter concludes with a description of the research objectives of this study.

*Autism Spectrum Disorders*

Autism was identified and named as a specific disorder over seventy years ago by Leo Kanner (1943). Since then, the subject of ASD has attracted a great deal of research. In particular, because ASD is viewed as involving neurological as well as behavioural issues, discussions of ASD have drawn on many disciplines, including neurology, genetics, nutrition, and psychology (e.g., DiCicco-Bloom, Lord, Zwaigenbaum, Courchesne, Dager, Schmitz, Schultz, Crawley, & Young, 2006; Happe & Ronald, 2008; Pellicano, 2010). Over the past two decades, several empirical studies have explored various aspects of this disorder in order to understand the competencies and impairments displayed by people with ASD (Cohen & Volkmar, 1997).

Autism is generally considered a disorder of brain development, and is viewed as having neurological origins (Carper & Courchesne, 2005; Courchesne, Carper, & Akshoomoff, 2003; Minshew, Sweeney, & Bauman, 1997; Vaccarino, Grigorenko, Smith, & Stevens, 2009). However, it is the behavioural features of ASD, rather than its neurological, biological, or cognitive manifestations that define the disorder. Diagnostic criteria of ASD include deficits in social communication and social interaction and restricted, repetitive patterns of behaviour, interests or activities (DSM-5).

More specifically, people with ASD demonstrate either historical or current deficits in social-emotional reciprocity, deficits in nonverbal communicative behaviors used for social interaction, and deficits in developing, maintaining, and understanding relationships (DSM-5).
Social difficulties are considered the most powerful predictor of a diagnosis of ASD (Volkmar, Chawarska, & Klin, 2005). Children with ASD rarely bid for the attention of others with gestures or vocalizations (Johnson & Myers, 2007) and they commonly demonstrate deficits in “social relatedness”, which is the innate drive to connect with others (Rogers, 2009).

In addition, for a diagnosis of ASD at least two types of repetitive patterns of behavior must be observed (DSM-5). These patterns include behaviours that are marked by rigidity, and inappropriateness, such as repetitive manipulation of objects, repetitive self-injurious behaviour and stereotyped movements (Turner, 1999). Unusual and repetitive motor behaviours have been noted in very young children with ASD (Maestro, Casella, Milone, Muratori, & Palacio-Espasa, 1999; Richler, Bishop, Somer, Kleinke, & Lord, 2007; Watson, Baranek, Crais, Reznick, Dykstra, & Perryman, 2007).

Social-Cognitive Theory

The social-cognitive learning theory of skill acquisition (Bandura, 1989), posits that social communication in typically-developing children emerges from, and develops within, social contexts. Accordingly, all cognitive development is socially mediated and dependent on interaction with others and with the environment (Mallory & New, 1994). The theory argues that children learn to understand and acquire social interaction skills from informative experiences. A child may observe a social behaviour and form an understanding of what it means. Subsequently, the child will use this understanding to interpret social interactions and model his own behaviour on it. In turn, the child observes how others judge the appropriateness of his modeled behaviour, and subsequently refines his understanding and modeling accordingly (see Ladd & Mize, 1983).
Social factors, such as the recognition of the communicative function of speech and observational learning are the cornerstone foundations for the acquisition of social communication (Bandura, 1989). Optimal development of social interaction skills has its origins in early parent-child as well as in sibling/peer interactions (Beckman & Lieber, 1992; Kaczmarek, 2002) and complementary theoretical perspectives describe its development. Social-interactionist perspectives of the acquisition of social communication skills explain the development of social communicative competence within a framework of early caregiver-child interactions (Bohannon & Bonvillian, 2001). Within these early caregiver-child interactions, children gain experience negotiating turn-taking with supportive partners, communicating shared knowledge, and playing games that switch roles.

Indeed, according to Vygotsky’s social interactionist perspective (1978), the social context forms cognitive processes, and is thus a crucial component of development (Bodrova & Leong, 2007). This theory posits that development is a social process that is assisted by others, adults or peers, who are more competent (Tudge & Winterhoff, 1993), and that learning is facilitated by interacting with a “more knowledgeable other”. For example, within the context of literacy acquisition it has been said that assistance from more capable others can scaffold children’s knowledge beyond their present levels of development. The research in this area suggests that mediation by a more knowledgeable other, including a parent, a teacher, or possibly a peer, is a means by which children can acquire knowledge (Vukelich, 1994).

In addition, these social exchanges provide children with opportunities to acquire social-communication skills, such as how to initiate, respond, and contribute to ongoing interactions. Initial social experiences are centered in the family, but as the growing child’s social world expands, peers assume an increasingly important role (Davidson & Smith, 1982; Dijkstra,
Kuyper, van der Werf, Buunk, & van der Zee, 2008). Complementary social-cognitive theories maintain that social competencies develop through multiple encounters with peers under the supervision of adults, during which social strategies (e.g., access, negotiation, conflict resolution, compromise, discourse adjustments) are practised and consolidated within increasingly complex social pretend play (e.g., Guralnick, 1992; Howes & Matheson, 1992). These early social experiences lay the foundation for more advanced social competencies that emerge in later preschool years, including (a) playing complementary pretend roles, (b) becoming aware of behavioural characteristics of group members, and (c) social perspective taking (Beckman & Lieber, 1992; Howes, 1987).

A large research literature (reviewed in Rubin, Bukowski, & Parker, 1998) supports the notion that the peer group is one of the more important influences on psychological adjustment in typically-developing children. Guralnick (1986) avers that “establishing successful relationships with one’s peers is one of the most important achievements of early childhood” (p. 93). A report prepared by the Child Mental Health Foundations and Agencies Network (Huffman et al., 2001) suggests that “social competence” which is defined as behaviour that reflects successful social functioning with peers (Denham, Wyatt, Bassett, Echeverria & Knox, 2009; Howes, 1987; Rao, Beidel & Murray, 2008; Rose-Krasnor, 1997) is rooted in the peer relationships that children experience early in their lives. In addition, peers provide the social environment that facilitates social-conversations and opportunities for practising language and play skills (Olley, Robbins, & Morelli-Robbins, 1993). A National Institute for Child Health and Development study (NIHCD, 2001) of almost 700 typically-developing children at 24 and 36 months concluded that children with experience in child care settings are more skilled in their peer play than those who were not exposed to ongoing peer interactions. Specifically, children
with prior experience in child care settings exhibit well-developed social competencies such as initiating play interactions, entering peer groups, directing attention of another child, and conflict resolution (Guralnick, 1992).

Socially competent children are responsive and able to integrate their behaviour with the behaviour of their play partners (Mize, 1995) and show sensitivity to the social context and to others. Also, children who have had many opportunities to play with peers from an early age are at an advantage when they enter formal group settings such as child care or elementary school (Ladd & Price, 1987; Lieberman, 1977). This benefit is especially marked when they can develop long-lasting relationships. Young children, even toddlers, who are able to participate in stable peer groups become more competent over time and have fewer social interaction difficulties than children who participate in groups where membership changes (Howes, Rubin, Ross, & French, 1988).

**Development of Social Competence in Typically-Developing Children**

The development of the capacity for social attention coordination, or "joint attention," is a major milestone of infancy (Mundy, Card, & Fox, 2000). Joint attention skills refer to the capacity to coordinate attention with others regarding objects and events (Mundy & Gomes, 1998) and these skills are considered to be critical to early social, cognitive, and language development as well as to infants’ active participation in social learning opportunities (Mundy & Newell, 2007). Infants and toddlers typically display systematic, age-related gains in joint attention skill development between 6 and 18 months of age. Eckerman & Stein (1982) suggest that an infant gradually acquires interactive skills, that is, ways of behaving with others which enable the infant to participate more fully in structuring the interactions. Initially, the infant may
become a full participant only in well-rehearsed routines of interaction with familiar partners. Later, the infant is able to generate new patterns of interaction with these familiar partners and engage new partners in familiar routines. Later still the infant is able to generate original interactions with different partners. Thus, the toddler is able to develop a variety of social repertoires with different partners, preparing for appropriate social interactions with peers.

Hart & Risley (1999) collected normative data on 42 1- and 2-year old typically-developing children and found that, even before they had learned to talk, children had learned the social skills fundamental to interaction. In other words, between the ages of 1 and 2, children were able to get their parents’ attention, take turns, and maintain interactions by cooing, smiling, and babbling and thereby develop the capacity to engage in social interaction with peers (Howes, 1987). Howes suggests that during this period children are able to structure social interaction in a complementary and reciprocal fashion, wherein partners take turns and exchange roles in play, such as in games of hide and seek, or run and chase. At this stage children also form stable preferences for specific peers (Howes, 1987).

Ross, Lollis, & Elliott, (1982) investigated early toddler peer communication. They studied 48 typically-developing toddlers (20 – 22 months of age) during free play in same-sex dyads. The authors measured communicative overtures and responses between the dyads in 15-minute free play sessions. Communicative overtures were defined as actions, gestures, or words that were directed towards a peer and invited the peer’s involvement. In addition, overtures had to be capable of imparting information concerning the goals of the child making the overture. Examples of overtures included showing, giving, and offering objects to the peer, requesting objects, expressive actions or words, invitations to play, attempts to join peer play, and protests of peer actions. Responses to the communicative acts were defined as actions, gestures, or words
that reflected awareness, comprehension and/or compliance with the overture. Ross and her colleagues described “frequent and varied communication” that exists between toddler peers. That is, toddler dyads initiated communicative overtures with one another an average of 25.3 times within a 15 minute free play session. The toddlers’ responses provided evidence that within the dyad the toddlers were almost always (96% of the time) aware of their partner’s overture. Toddlers often displayed comprehension of the overture (61% of the time), and complied with about half the overtures (52%) that they understood. The data collected and described in this study clearly illustrate the extent and variety of communicative overtures and responses involved in early toddler peer interaction.

Howes, Rubin, Ross, & French (1988) describe the progression from the early toddler complementary and reciprocal interactions to later developing cooperative social pretend play. In both forms, the complementary role of the partner is acknowledged, and the action of the partner is reversed. In the early complementary and reciprocal peer play action, roles are acknowledged (e.g., chased and chaser) and changed. In later developing cooperative social pretend play, between the ages of 2 and 3, it is the pretend roles that are acknowledged (e.g., store-keeper and shopper) and changed. At this stage children develop the ability to communicate the “joint understanding of the theme of the interaction” (p. 3) in order to engage in cooperative social pretend play. In other words, they understand that their partner is acting out a play role, and that this role can be reversed. When children communicate meaning they signal that they know how to play a particular game (for example, hide-and-seek); they communicate the invitation to begin the game (eye-gaze with running to hide); to switch roles (“my turn”); and the understanding that they share this knowledge (Howes, 1987). Howes suggests that children’s communication of
meaning makes possible a broader range of games and variations on themes of games, in addition to early forms of social pretend play.

By the time they reach the preschool period (between 3 and 5 years of age), children’s interactions with peers increase in frequency and importance (Denham, Wyatt, Bassett, Echeverria, & Knox, 2009). In addition, during the preschool years significant changes take place in the general pattern of social behaviour. Specifically, the preschool age is when children’s acquisition of social, cognitive, and communication skills allow them to move away from the general tendency to play alone or alongside peers and to begin engaging in social interactive play (Schaefer, Light, Fabes, Hanish, & Martin, 2010). Thus, over the course of preschool, we often see the emergence of social behaviours that reflect an orientation towards affiliation and engagement with peers.

*Development of Social Competence in Children with ASD*

In contrast to typically-developing children, children with ASD display significant deficits in their development of social competence (Wetherby, Watt, Morgan, & Shumway, 2007). Many recent studies confirm this finding (e.g., Holmes & Willoughby, 2005; Kemp, Kishida, Carter, & Sweller, 2013; Pierce-Jordan & Lifter, 2005; Rotherham-Fuller, Kasari, Chamberlain, & Locke, 2010). Risk factors are often identifiable prior to the child’s first birthday and infants who subsequently are diagnosed with ASD may exhibit subtle disruptions in social interest and attention, communication, and temperament that occur prior to the onset of clinical symptoms (Adrien et al, 1993; Turygin, Matson, Williams, & Belva, 2014; Webb & Jones, 2009).
As stated above, the development of joint attention skills which occurs between 6 and 18 months of age is typically considered to be critical to early social, cognitive, and language development (Mundy, Card, & Fox, 2000). Deficits in this area appear to be a distinguishing feature of children with ASD (Dawson et al., 2004; Turner, Stone, Podzol, & Coonrod, 2006; Webb & Jones, 2009; Wetherby, Watt, Morgan, & Shumway, 2007). Joint attention difficulties, such as following a point or giving an object, are commonly reported by parents of children with ASD (Wimpory, Hobson, Williams, & Nash, 2000), and have been identified in many observational studies (eg, Baron-Cohen, Allen, & Gillberg, 1992; Maestro et al., 2001; Werner, Dawson, Munson & Osterling, 2005; Zwaigenbaum, Bryson, Rogers, Roberts, Brian, & Szatmari, 2005). Osterling and Dawson (1994) retrospectively analyzed videotapes of first birthday parties of 11 children who were later diagnosed with ASD and found evidence of atypical behaviours such as lack of pointing, showing, failure to orient to name, and unusual eye contact that predicted the subsequent diagnosis of ASD.

Bryson et al., (2007) followed prospectively 9 infant siblings of children with ASD who were subsequently diagnosed with autism. These infants were monitored from 6 months of age. By 12 months, most of the infants were displaying reduced social smiling, limited interest and pleasure in responsiveness to others, difficulty in engaging in face-to-face activities, limited social gestures, and reduced social babbling. Werner, Dawson, Munson & Osterling (2005) interviewed parents of 72 three- to four- year old children with ASD about their early development and reported that by 13 to 15 months these children were displaying many social symptoms of ASD such as poor eye-contact, failure to orient to name, little interest in joint attention, and poor social interaction. These findings were further corroborated by Ozonoff et al., (2010) who interviewed parents of 243 infants (151 siblings of a child with ASD and 92 who had
no risk factor) regarding their development at 6, 12 and 18 months of age. Between 12 and 18 months of age, parents of the children who were later diagnosed with autism voiced concerns about social engagement, interest in other people, social or emotional reciprocity, and social attention.

Early warning signs identified in young toddlers with autism include delayed early social communication behaviours such as vocalization (Wetherby at al., 2004), using different social gestures (Landa, Holman & Garrett-Mayer, 2007) and coordinating verbal and non-verbal behaviours (Wetherby et al., 2004). Toddlers with ASD are also less likely to show pleasure during joint attention episodes (Baron-Cohen et al., 1992; Wetherby, Watt, Morgan, & Shumway, 2007) and are less likely to initiate joint attention to request assistance from others (Charman, 1997; Landa et al., 2007; Wetherby et al., 2007).

Between their second and third year, toddlers with ASD display a preference for being alone, limited social smiling, limited interest in other children, and little interest in interactive games, such as social games and turn taking (Chawarska & Volkmar, 2005). These characteristic behaviours impact their ability to develop peer relations. Fodstad, Matson, Hess, & Neal (2009) used the Baby and Infant Scale for Children with Autism Traits (BISCUIT) to measure symptoms of ASD in toddlers aged of 17–37 months. Toddlers who had been diagnosed with ASD scored significantly higher than those diagnosed with developmental delays on items such as ability to share enjoyment, interests or achievement with others; interest in participating in social games, use of too few or too many social gestures; and development of social relationships. In a further study, Matson, Neal, Fodstad, & Hess (2010) analyzed the relationship between socialization and challenging behaviours among 153 toddlers (aged 22 – 36 months) with ASD. According to the results, a higher frequency of challenging behaviours, including stereotypies,
aggressive/destructive behaviour and self-injurious behaviour which are often displayed by toddlers with ASD, were related to lower levels of peer interaction.

Children with ASD often have difficulties with the social-interactive aspects of language, that is, with the *pragmatics* of language. These can include difficulties in understanding other’s communicative intentions, adapting to the needs and status of a conversational partner, distinguishing between given and new information, following politeness rules, making relevant comments, maintaining conversational topics outside their own obsessive interests, and giving listeners their fair share of conversational turns (Lord & Paul, 1997). Social interaction skills span many domains and include a broad array of verbal and non-verbal behaviours, such as eye-contact, smiling, gestures, non-verbal and verbal communication (Wetherby, Watt, Morgan, & Shumway, 2007). It appears that the pragmatic impairments in the language of children with ASD may underscore deficits in foundational social interactions (Carpenter and Tomasello, 2000), which will, of course, impact on the development of peer relationships.

Children with ASD typically have more difficulty with social interaction than their same age peers without ASD (Rogers, 2000). Many recent studies confirm this finding (e.g., Holmes & Willoughby, 2005; Kemp, Kishida, Carter, & Sweller, 2013; Pierce-Jordan & Lifer, 2005; Rotherham-Fuller, Kasari, Chamberlain, & Locke, 2010). Holmes and Willoughby (2005) documented the social play behaviours of seventeen 4 to 8 year old children diagnosed with autism in naturalistic classroom settings and found that the most frequently observed play behaviours included parallel play, play interactions with adults, and solitary functional play, whereas typically-developing children of a similar age characteristically engage in group play with peers. Similarly, Pierce-Jordan and Lifter (2005) analyzed videotaped observations of 21 preschoolers (12 children diagnosed with Pervasive Developmental Disorder and 9 typically-
developing children) playing together in small integrated groups and reported that children diagnosed with PDD were less likely to engage in social interaction than their peers. Kemp, Kishida, Carter, and Sweller (2013) compared the engagement of children with ASD to those with other types of disability. The 11 children with ASD included in this study were less engaged during free play than the children with disabilities not diagnosed with ASD. Similarly, adult engagement and peer interaction also occurred less frequently in free play for the children with ASD.

Jahr et al. (2007) examined the frequency of social interaction of 23 preschoolers with autism (12 diagnosed as high functioning and 11 with mild mental retardation) and 17 typically-developing children in an integrated preschool setting. This study focused on naturally occurring social behaviours of young children in an inclusive setting. It also included assessment of the social behaviours of the typically-developing children, thus providing a measure of normative behaviour for some features of social interaction. Results indicated that the typically-developing preschoolers interacted during almost 90% of the observational periods, whereas the high-functioning children with autism interacted only during 30% of the time. The children diagnosed with autism and mild mental retardation interacted only during 15% of the time.

A study reported by McGee, Feldman, and Morrier (1997) reported that preschoolers with autism spent less time in proximity to other children, received fewer initiations from peers, and were less likely to focus on other children or adults as interactive partners. When children with ASD are placed in play groups with typical peers, there are few or no peer interactions without intervention (e.g., Banda, Hart, & Liu-Gitz, 2010; Conroy, Boyd, Asmus, & Madera, 2007; Lifer & Pierce-Jordan, 2005; Wichnick, Vener, Pyrtek, & Poulson, 2010). Furthermore, Rotherham-Fuller, Kasari, Chamberlain, and Locke (2010) examined social involvement of 20
preschoolers with ASD and 20 age-matched typically-developing peers in inclusive classroom settings. Results indicated that the children with ASD were less accepted, had fewer reciprocal friendships, and fewer social connections than matched peers. In addition, children with ASD were more likely to be isolated or peripheral to social relationships within the classroom.

Preschool-aged children who have positive peer relationships are likely to maintain positive peer interactions in grade school, while children who have a hard time getting along with agemates in the preschool years are more likely to experience later academic difficulties and rejection or neglect by their elementary-school peers (Ladd, 1990; Ladd & Price, 1987; Ladd, Price, & Hart, 1988). Without the skills to play constructively and develop friendships with agemates, children become excluded from opportunities to develop additional and more complex skills important for future peer interaction (Eisenberg, Cameron, Tryon, & Dodez, 1981; Howes, Rubin, Ross, & French, 1988). Conclusions from a study investigating preschool peer interactions suggest that positive interactive play behaviour between preschoolers is associated with active interest and engagement in classroom activities, whereas withdrawal from interactive play relates to inattention, passivity and lack of motivation to learn (Coolahan et al., 2000). Nix et al., (2013) found that improving preschoolers’ social emotional skills (e.g., social problem solving, positive social behaviour) had positive intervention effects on reading achievement and learning engagement.

It is possible to hypothesize that children who do not engage in social interactions may have less opportunity to practise and refine their interactive social communication skills. These children might not receive linguistic and affective messages adequately from their caregivers. For example, they might be slow or disorganized in their responses, and therefore not give caregivers the expected feedback (Giddan, Bade, Rickenberg, & Ryley, 1995). This is likely to
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imply a perpetuation of the negative cycle of reduced opportunities for social interaction and communication. The fact that children who have not developed age appropriate social skills are typically excluded from their peer culture only serves to exacerbate their disability (Wolfberg & Schuler, 1999). Language development is therefore viewed as a self-reinforcing interactive process. Social interaction supports language acquisition, and, in turn, the acquisition of language allows mature social interaction. If either language or social interaction are in any way lacking, both these aspects of development may be compromised.

Available data seems to suggest that social interactions are *not* preferred activities for young children with ASD. Rather, it appears that children with ASD prefer solitary play and proximal onlooking (McConnell, 2002). This isolation may be further exacerbated given that social interactions with peers require different skills from those needed with adults (Koegel, Koegel, Frea, & Fredeen, 2001). For example, while adults tend to be the initiators and provide a highly responsive social environment, child-child interactions rely on the effective participation and contribution of both partners (Guralnick, 1990). Children with ASD are also less likely to develop appropriate peer relationships according to age and language ability (Bauminger & Kasari, 2000; Howlin, Mawhood, & Rutter, 2000). They often lack the ability to use social cues such as eye-gaze, facial expression and gestures to regulate social interaction, and fail to develop peer relationships that are appropriate to their developmental level (Wolfberg, Bottema-Beutel, & DeWitt, 2012).

*Interventions for Preschoolers with ASD*

The importance of early intervention for children with ASD has been extensively documented in the research literature. Studies reporting on comprehensive treatment programs
designed to stimulate changes in young children with ASD have overwhelmingly validated their efficacy (e.g., Bass & Mulick, 2007; Chan et al., 2009; Reichow & Volkmar, 2010). Much of the research has focused on interventions to promote adaptive and appropriate social and language behaviour. A particularly significant contribution to this field is the work of Lovaas (1981). This well-documented intervention is founded on basic behaviour modification principles and involves discrete-trial teaching, breaking skills down into their most basic components, and rewarding positive performance with praise and reinforcers. Data from intervention and follow-up studies (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993) suggest that this intervention approach can produce substantial improvements in the overall functioning of young children with ASD.

Unfortunately, despite the functional gains achieved by these programs, traditional behaviour modification has failed to significantly affect social, communicative, and imaginative dysfunction in children with ASD. Behaviour modification focuses on single, specific behaviours that can be increased or decreased (Baron-Cohen & Bolton, 1993), whereas social behaviour is multi-faceted. Rogers (2000), in a review of interventions designed to improve social interactions in children with ASD, suggests that social skills acquired through work with adults do not generalize to peers without specific peer training (p.406). The implication of the above is that even those children diagnosed with ASD who are provided with effective behaviour modification programs and who are successful in acquiring basic language skills may face considerable difficulties with spontaneity of communication and with social interactions. Indeed, it has been suggested that the distinct communicative profile observed in children with ASD may actually be exacerbated by traditional behaviour modification interventions because
these may compromise development of spontaneity and of appropriate social interactions (Quill, 1995; Wetherby, 1986).

It is against this backdrop that naturalistic programs, in which teachers and caregivers employ events occurring in the everyday environment, were developed (Charlop & Haymes, 1994; Harper, Symon, & Frea, 2008; Kishida & Kemp, 2009; Kohler, Anthony, Steighner, & Hoyson 2001). These naturalistic programs aim to provide instruction that will enhance spontaneity in social interaction and heighten the appropriateness of communicative interactions within the children’s daily environments.

Given the goal of enhancing the social skills of children with ASD, it is clearly important that these children be able to communicate and interact naturally and spontaneously. Spontaneity is required in many communicative and interactive interactions such as requesting, rejecting, and offering information. And, given the inherent contradiction between spontaneity and instructor-initiated interactions, there is a need to utilize interventions that circumvent dependence on instructors.

Parents and educators have been successful in producing clear treatment effects with behavioural techniques such as teacher-prompting, modeling (e.g., Beilinson & Olswang, 2003), and time-delay (Liber, Frea, and Symon, 2008). However, use of these techniques alone does not promote development of age-appropriate play skills or of peer social interactions that are among the core deficits inherent in the definition of ASD. Since children’s naturalistic environments involve interactions with peers who can provide linguistic and social-conversational models, and opportunities for practising interactive play skills, it appears judicious and practical to use peers as intervention agents (Guralnick, 1990; Ostrosky, Kaiser & Odom, 1994; Strain & Odom, 1986).
Several studies examined the effect of placing preschoolers with ASD in an integrated setting together with typically-developing peers, with no specific instruction or direction to any of the children (e.g., Lord & Hopkins, 1986; Roeyers, 1996; Sontag, 1997). In these studies the intervention was dependent on the transmission of appropriate social skills from the more socially competent peer to the child with ASD. Results suggested that while some increase in the level of children’s responsiveness (Lord & Hopkins, 1986) and tolerance of peer proximity (Roeyers, 1996) were noted, mere placement in integrated settings, without trained peer or teacher support, did not often produce positive outcomes for preschoolers with ASD. It appears that, for children with ASD, for whom impairments in social interaction are central to the disorder, simple exposure to peers and responsive adults may be insufficient to develop their peer interaction skills. Further evidence to support this claim is derived from examination of baseline data from experimental studies that place children with ASD and their peers into play activities revealing limited interactions (Banda et al., 2010; Conroy et al., 2007; Trembath, Balandin, Togher, & Stancliffe, 2009; Wichnick et al., 2010).

Peer-mediated interventions involve typically-developing peers who are systematically taught ways of engaging learners with ASD and increasing their social opportunities within natural environments thereby helping learners with ASD acquire new behavior, communication, and social skills (Fettig, 2013). Current interventions to promote peer interactions in child care settings include (a) manipulating environments, (b) prompting peer interactions, (c) training peer tutors, (d) direct skills training, and (e) comprehensive interventions that include two or more of these interventions (see comprehensive reviews by Bass & Mulick, 2007; Chan et al., 2009; Goldstein et al., 2007; Wang et al., 2011). In these peer-mediated interventionist studies, typically-developing children are taught ways of engaging children with ASD in positive social interactions.
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interactions (English, Goldstein, Shafer, & Kaczmarek, 1997; Kohler, Strain & Shearer, 1992; Strain & Odom, 1986). Children in these studies are normally preschool or school-aged, with most participants over 6 years of age (Matson, Matson, & Rivet, 2007; Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011; Wang et al., 2011; White, Keonig, & Scahill, 2007). Peer interventionists are trained to direct specific social strategies, such as invitations to play, offers of assistance, offers to share, and demonstrations of affection to children with ASD (e.g., Bass & Mulick, 2007; Goldstein et al., 2007; Kohler, Strain, Maretsky, & DeCesare, 1990).

The findings reported in several studies suggest that interventions that systematically teach socially competent peers to engage children with ASD in positive, playful activities may have substantial effects on their social skills. For example, Banda, Hart, and Liu-Gitz (2010) used direct instruction and peer training with two six year old boys with ASD and their typically-developing peers in integrated settings. The participants were trained to initiate and respond to each other during different activities. Increased initiations and responses in all participants were noted. In a study described by Kohler, Greteman, Raschke, & Highnam (2007), the researchers trained six typically-developing peers to share, request, provide play suggestions, initiate and respond, participate in conversations, give compliments and assistance, and show affection to a preschooler diagnosed with ASD. Results indicated that the children’s interactions became longer and more reciprocal over time.

Furthermore, in several studies reported, the researchers taught the children with ASD strategies to engage their typically-developing peers in social interaction. For example, Wichnick et al., (2010) used pre-recorded scripts to teach three children with autism ages 5 through 7 years to respond to peer initiations and found that the children with ASD increased their positive responses to the social bids of their typically-developing peers. In an intervention described by
Conroy, Boyd, Asmus, & Madera (2007) taught a 4-year-old boy with a diagnosis of ASD specific prompts to encourage his social interactions with classroom peers. Post-intervention results suggest a significant increase in the amount of time that the child with ASD was engaged in social interactions with his typically-developing peers. Nelson, McDonnell, Johnston, Crompton, & Nelson (2007) examined the effects of a visual intervention strategy on the initiations of four preschoolers in an inclusive preschool setting. This intervention package utilized a peer-mediated teaching strategy to promote the use of a laminated paper key that was shown to peers to initiate play. Target children received training on the use of and response to the keys through an incidental-teaching, peer mediated intervention model. Data shows that all four preschoolers increased the percentage of their unprompted successful initiations into play situations with their trained peers. In addition, the children increased their engagement time in joint activities.

Systematic reviews that support the efficacy of these interventions have been previously published (e.g., Bass & Mulick, 2007; Chan et al., 2009; Reichow & Volkmar, 2010; Wang et al., 2011) and outcomes reported for peer-mediated interventions for children with ASD have been positive. For example, in their review of interventions that were designed to improve peer skills to facilitate the social play activities of children with ASD, Bass and Mulick (2007) suggest that in peer-mediated approaches where typically-developing peers are taught to initiate and maintain interactions, peers can facilitate improvements in the social play behaviours of children with ASD. Chan et al. (2009) reviewed forty-two studies that focused on the use of peer-mediated interventions in the treatment of individuals with ASD. The 42 studies involved a total of 172 participants ranging in age from 3 to 13 years, who received intervention from a total of 396 trained peers. The most common dependent variable in these studies was some form of
social interaction, which included joint attention, communication, turn taking and sharing, and affection. The reported outcomes of the interventions were predominantly positive (91%), and the reviewed studies suggest that peer-mediated intervention “is a versatile and potentially effective intervention approach for individuals with ASD” (p. 876).

**Research Objectives**

The study presented in this dissertation aimed to confirm and expand upon the results of studies presented in the cited literature. The specific objectives of the current study, which examined the effect of a peer-mediated intervention on the social interactions of preschoolers with ASD, were as follows:

1. To determine whether, after intervention, children with ASD would engage in more and longer extended interactions with their trained peers. While the use of typically-developing peers as agents to facilitate social interactions in children with ASD has been shown to provide positive gains in the frequency of interactions between children with ASD and their peer interventionists (Goldstein, Kaczmarek, Pennington, & Shafer, 1992; Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008; Trembath, Balandin, Togher, & Stancliffe, 2009; Wichnick et al., 2010; Zanolli, Daggett, & Adams, 1996), only few studies have measured the length of these interactions (Conroy, Boyd, Asmus, & Madera, 2007; Kohler, Strain & Shearer, 1992; Lord & Hopkins, 1986; Nelson et al., 2007). Licciardello, Harchik, & Luiselli (2008) conclude that it is important to collect data on the length or duration of interactive play. Brown & Conroy (2002) suggest that teaching peer interventionists strategies such as redirecting, prompting, and persisting is likely to facilitate extension of social-communicative exchanges and recommend further investigation to support this claim.
2. To determine whether, following intervention, children with ASD increase both their rate of responding to trained typically-developing peers and the rate initiating interactions with them. According to Hadley and Rice (1991), participation in an interactive exchange requires basic primary skills that include the ability to appropriately respond to a peer and the ability to initiate an interaction. Thus, an important question concerns whether peer-mediated interventions can successfully target the ability to initiate interactions as well to respond to peers. Indeed, several peer-mediated intervention studies report gains in generating responses in preschoolers with ASD (e.g., Kalyva & Avramides, 2005; McGrath, Bosch, Sullivan, & Fuqua, 2008). In contrast, however, the success of peer-mediated interventions on initiations has not been consistent (e.g., Conroy, Boyd, Asmus & Madera, 2007; Nelson et al., 2007). In general the view has been that children with ASD are more likely to respond to bids for joint attention than to initiate bids for joint attention, compared to their typically developing peers (MacDonald et al., 2006). Over and above their difficulties with all social interactions, children with ASD appear to have relatively more difficulty with self-initiated joint attention, in which they draw the attention of a peer to a referent, as compared to responsive joint attention, in which they respond by shifting attention to an identified referent (Houghton, Schuchard, Lewis, & Thompson, 2013). Furthermore, initiating interactions is viewed as a vital social skill because before children can engage in a peer interaction they must find a way to initiate interactions (Beilinson & Olswang, 2003). Specific difficulty initiating play and entering peer groups is considered a hallmark deficit in the social difficulties of children with ASD (Beilinson & Olswang, 2003; Koegel, 2000). In view of the above discussion, this research considers and reports on responses and initiations separately.
3. To determine if the child with ASD would be able to generalize learnt interactive skills to typically-developing peers who had not been trained. Research in ASD intervention often lacks measurement of generalization of peer interaction skills to other interaction partners (Bass & Mulick, 2007; Matson, Matson, & Rivet, 2007; McConnell, 2002). Timler, Vogler-Elias & McGill (2007) suggest that, in order to be considered effective, interventions must show generalization of skills during “authentic interactions with peers” (p. 167). Data regarding generalization of skills to untrained peers would therefore indicate more completely the efficacy of an intervention.

4. To determine the social validity of the intervention. Many studies measuring gains in responses and initiations of children with ASD do not consider measures of social validity. Social validity provides a value judgment from society on the importance of the impact of the intervention (Hurley, Webby, & Feurer, 2010) as well as its practicality and usefulness (Hunt, Soto, Maier, Liboiron, & Bae, 2004). Matson et al., (2007) reviewed 79 interventions aimed at enhancing social skills with children with ASD ranging from 3 to 18 years of age. Only 10% of the studies considered social validity. Thus, measures of social validity will provide an important addition to the existing literature.

5. To measure the fidelity of the intervention. Measurement of fidelity in intervention studies is important for two reasons. Firstly, measuring fidelity allows investigators to document the fact that findings were not due to the lack of fidelity in a study. In addition, fidelity measures provide information for replication studies and add to the description of children’s experiences in the study (Wolery, 2011). Treatment fidelity measures are rarely reported in intervention studies (Chan et al., 2009), and inclusion of these measures will lend support to outcomes of the intervention.
The current research presented addresses the abovementioned objectives. In the research paper presented in Chapter 3, I consider the impact of the intervention on both the number and length of extended interactions between the children with ASD and their typically-developing peers, thus providing data on the length and duration of interactive play. In addition, in this study the social validity of the intervention and treatment fidelity were measured and confirmed.

In the research paper presented in Chapter 4, I present data on the effects of the intervention on the responses and initiations of the children with ASD, thereby extending the current literature on these issues. In the same paper, the question of whether the children with ASD generalized the effect of the intervention to untrained peers is examined. In addition, further measures of social validity are presented.
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CHAPTER 2

Method

In this chapter I describe the methodology used in the studies that are published in Chapter 3 and Chapter 4 of this dissertation. This includes a description of (a) the research design, (b) recruitment and eligibility criteria, (c) independent measures, (d) the participants in the study, (e) the setting and materials used, (f) early childhood educator training, (g) a detailed description and rationale of the intervention, (h) treatment fidelity, (i) data collection, (j) outcome measures, and (k) inter-rater agreement measures.

Research Design

A single-subject multiple baseline across subjects design was used to examine the relationship between the independent and dependent variables. This specific design was selected because single-subject experiments can be used to suggest cause-effect relationships and are specifically tailored for intervention research with small numbers of participants (McReynolds & Thompson, 1986). Indeed, 89% of the social skills interventions aimed at preschoolers with ASD that were reviewed by Reichow and Volkmar (2010) used single subject designs. Single-subject design allows each child to be used as his/her own control, in observing specific changes in behaviour, which helps to assess the impact of an intervention (Bordens & Abbott, 1999). Experimental control is established at several points in the investigation: during the baseline phase when behaviours are expected to remain stable; during the intervention phase when behaviour is expected to change in response to intervention; and when replication of intervention effects is measured across participants (Barlow & Hersen; McReynolds & Kearns; McReynolds & Thompson; Tawny & Gast, 1984). Employing multiple baselines for different subjects makes it possible to use the research participants as controls for one another (McReynolds & Kearns,
1983) and is robust in its ability to maintain experimental control (Barlow & Hersen, 1984; McReynolds & Kearns, 1983; McReynolds & Thompson, 1986). A single-subject multiple baseline across subjects is therefore well suited as an experimental design in assessing the efficacy of the experimental intervention considered in this study.

The specific design used in this study was a single-subject design with non-concurrent multiple baselines across subjects. This “non-concurrent multiple baseline design”, developed by Watson and Workman (1981), is useful in situations where subject limitations, such as the non-simultaneous availability of the subjects (as was the case in this study), preclude contemporaneous baselines. In this design the researcher pre-determines the increasing length of each of the baseline phases. As subjects are recruited, they are randomly assigned to one of the pre-determined baseline lengths and baseline measures are observed. Assuming that acceptable stability levels are reached in the baseline, intervention is implemented at the pre-determined point in time. Subjects who do not meet stability criteria during baseline are dropped from the investigation (Watson & Workman, 1981). The advantage of the non-concurrent design is, therefore, that it allows for flexibility in applied research settings while maintaining the design parameters necessary for evaluating the relationship between treatment variables and behavior changes.

The design of this study is depicted in Figure 1. The 3 participants with ASD were randomly assigned to a baseline length of 2, 3, or 4 weeks. However, due to scheduling problems at the childcare centres (e.g., vacations, special programming, absences) their baselines were, in effect, 2, 4, and 5 weeks long. Nonetheless, the incremental increases in actual baseline lengths were consistent with the originally planned non-concurrent baseline design, in that each baseline extended over a longer period of time than the baseline of the previous participant.
The intervention program consisted of four consecutive parts: (a) two early childhood educator (ECE) training meetings that were followed by baseline measurement, (b) five half-hour social skills training sessions that involved the child with ASD and the two peer interventionists; (c) the implementation phase of the program where the target child and a peer interventionist practiced the strategies learned; and (d) following the implementation of the program, four follow-up and support meetings that took the form of telephone conversations with the early childhood educators.
Eligibility and Recruitment

To begin, approval was obtained from the Ethics Review Office of the University of Toronto (Appendix A).

Children with ASD were eligible for the study if they:

1. were between 3½ and 5½ years old;
2. had been classified as meeting the criteria for Autism Spectrum as determined by the Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter and DiLavore, 1999), and had also received a clinical diagnosis of autism spectrum disorder from a pediatric neurologist, pediatrician, or psychiatrist;
3. had a score of ≥18 months on the Communication Domain and the Socialization Domain as evaluated by the Vineland Adaptive Behaviour Scales (VABS, Sparrow, Balla and Cichetti, 1984);
4. spoke English as their primary language, though they may have been exposed to another language for less than 10 hours per week;
5. had non-verbal cognitive skills that were within 1.5 standard deviations of the mean, as assessed by the Brief IQ section of the Leiter International Performance Scale–R (Royd & Miller, 1997);
6. had not received intensive behavioral therapy (ABA);
7. had been attending full-time integrated childcare settings with access to a resource teacher for at least 6 months prior to the beginning of the study;
8. attended childcare centres where the supervisor had agreed to allow this study to take place;
9. their parents had signed consent forms to allow them to participate in this study.
In addition to the above criteria, children were only eligible for the study if their early childhood educator satisfied the following criteria. The early childhood educators had to:

1. have completed post-secondary education;
2. hold a diploma in early childhood education earned at a Canadian institution;
3. hold the primary position of responsibility for the delivery of the daily program for the child with ASD in the classroom;
4. have had at least two years’ experience with preschoolers in the childcare centre;
5. have had at least six months experience with a child with special needs;
6. have completed a questionnaire and signed a consent form (Appendix A) agreeing to be an active participant in this study.

I recruited children with ASD by presenting information regarding the study to speech-language pathologists and psychological associates in the Greater Toronto Area and asking them to refer suitable candidates. I also posted details of the study at the Child Development Clinic at the Hospital for Sick Children, Toronto, and on the electronic newsletter of the Canadian Autism Intervention Research Network (CAIRN) (http://www.cairn-site.com/en/index.html). The above efforts yielded a total of 19 children who were referred for the study. Parents of the 19 children called me for further information on the study, and following these initial telephone conversations, parents of three of the children declined to participate in this study. The remaining 16 parents allowed me to contact the supervisors of the childcare centres attended by their children in order to obtain the supervisors’ agreement to the terms of the research. All the supervisors stated that they were eager to allow the research project to take place at their centres. However, in three cases specific logistical issues proved to be barriers: two supervisors could not guarantee allocation of a quiet space in the childcare centre for the videotaping sessions, and one
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of the supervisors could not arrange for a replacement early childhood educator to be in the childcare room while the participating early childhood educator was occupied with the study participants. The remaining 13 supervisors were then asked to forward the information to the early childhood educator in the relevant classroom, to see if he/she was interested and willing to be involved in this study. All the early childhood educators agreed, and 13 children were assessed for inclusion in the study.

Upon further examination of children’s existing health records and parent surveys, 10 of the 13 children were found to be ineligible to participate. Four of the 13 children were discovered to have received intensive ABA treatment in the past; one child attended childcare only on a part-time basis; two of the children did not meet speak English as a primary language (one spoke Mandarin at home, and the other spoke Farsi); one child had received a clinical diagnosis of autism spectrum disorder from a pediatric neurologist but she did not meet the criteria for Autism Spectrum as determined by the ADOS (Lord, Rutter and DiLavore, 1999); and two children had scores on the VABS (Sparrow, Balla and Cichetti, 1984) indicating communication skills below the 18-month level. The parents of the three remaining children received a complete information package regarding the intervention (Appendix A), signed a consent form (Appendix A), and completed a Case History Questionnaire (Appendix B) for their children.

I asked the early childhood educators to nominate three peer interventionists for each child with ASD. Peer interventionists were eligible for the study if they:

1. attended the same childcare classroom as the child with ASD;

2. were between no more than 8 months younger or 14 months older than the child with ASD;
3. had age-appropriate language skills as measured by the Preschool Language Scales – 4th ed. (PLS-4) (Zimmerman, Steiner & Pond, 2002);
4. spoke English as their primary language, though they may have been exposed to another language for less than 10 hours per week;
5. had age-appropriate social skills as reported by the early childhood educator using the Social Interaction Assessment Scale (Appendix B, adapted from McConnell and Odom, 1999);
6. demonstrated high levels of compliance as reported by the early childhood educator using the Social Interaction Assessment Scale;
7. had previously expressed interest in or approached the child with ASD during playtime, as reported by the early childhood educator.

I asked the early childhood educator to give information packages, consent forms (Appendix A) and case history questionnaires (Appendix B) to the parents of the nominated typically developing peers. All the parents who were approached signed the consent forms, thus allowing their children to participate in this study.

Independent Measures

The standardized and non-standardized tests and scales listed below were used during intake to provide estimates of the children’s developmental functioning. Details of the measures can be found in Appendix B. The pre-intervention measures were administered during two or three visits to each childcare centre. Those measures that require direct one-to-one interaction with the child were administered in a quiet room in the childcare centre. Parents and early
childhood educators completed all questionnaires and scales prior to the beginning of the baseline phase.

*Case History Questionnaire.* Parents of the children with ASD completed a Case History Questionnaire (Appendix B) to provide background information. This questionnaire sought demographic information regarding parents and siblings, relevant details of the child’s developmental history and milestones, concerns regarding the child’s presenting problems, and information regarding any intervention programs that the child had received. The questionnaire was completed by all parents whose children participated in the study.

*The Social Interaction Assessment Scale.* The Social Interaction Assessment Scale (adapted from McConnell and Odom, 1999, Appendix B) was completed by the early childhood educators for all children (i.e., those with and those without ASD), to measure educators’ perceptions of the children’s sociability. This scale included measures of prosocial behavior and measures of peer engagement and responsiveness.

*The Preschool Language Scales – 4th ed.* The Preschool Language Scales – 4th ed. (PLS-4) (Zimmerman, Steiner & Pond, 2002) were administered to all the children, with and without ASD, to obtain a standardized language score. The PLS-4 is a diagnostic measure of language development, and is widely used to assess receptive and expressive language skills (e.g.,Craig-Unkefer & Kaiser, 2002; Timler, Vogler-Elias, & McGill, 2007; Wolery & Garfinkle, 2002).

*The Autism Diagnostic Observation Schedule.* The Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter and DiLavore, 1999) was administered by a certified diagnostician prior to the child’s involvement in the study and was used to identify children with ASD. Results of the ADOS were requested (with parental consent) from the agency where the ADOS was administered.
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The Childhood Autism Rating Scale. I used the Childhood Autism Rating Scale (CARS, Schopler, Reichler, & Renner, 1986) to rate the children with ASD based on observed interactions at the childcare centre. The CARS, which is used extensively in clinical settings for the diagnosis of autism, is a behaviorally based clinical evaluation of behavior (Paul, 2001).

The Vineland Adaptive Behavior Scales. The Socialization and Communication domains of the Vineland Adaptive Behavior Scales (VABS, Sparrow, Balla, & Cicchetti, 1984) was completed by the early childhood educator for each child with ASD. The VABS, which assesses the social competence of handicapped and non-handicapped individuals from birth through age 19, is a widely used instrument to assess adaptive behavior (Minshawi, Ashby, & Swiezy, 2009).

The Leiter International Performance Scale – Revised. Four subtests in the Visualization and Reasoning Battery of the Leiter International Performance Scale – Revised (Leiter-R, Royd & Miller, 1997) were administered in order to obtain a cognitive profile for all children with ASD. The Leiter-R assesses in a nonverbal way the cognitive development of special populations of individuals aged 2 years up to 21 years for whom the usual tests of cognitive abilities may be inappropriate.

Participants

Children with ASD. Three children with ASD participated in this study. All three children attended integrated childcare centres in the Greater Toronto Area. Table 1 displays the demographic information and test scores that were taken for the children with ASD prior to their participation in this research. Pre-intervention ratings for the children with ASD by their early

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1 names used are pseudonyms
2 Integrated childcare centres in Toronto offer service to children who will benefit from individualized observation, program planning and intervention. These services are provided by Resource Educators who are Early Childhood Educators with certified training in the field of special needs.
Table 1
*Characteristics of the Children with ASD*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Lily</th>
<th>Jacob</th>
<th>Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>4;8</td>
<td>4;2</td>
<td>5;1</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>Months attending childcare</td>
<td>12</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>ADOS* score</td>
<td>16 (module 2)*</td>
<td>15 (module 1)*</td>
<td>11 (module 2)*</td>
</tr>
<tr>
<td>CARS* score</td>
<td>31</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>Cognitive IQ CS (Leiter)*</td>
<td>109</td>
<td>98</td>
<td>111</td>
</tr>
<tr>
<td>Language SS (PLS-4)* f</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory comprehension</td>
<td>87</td>
<td>59</td>
<td>95</td>
</tr>
<tr>
<td>Expressive communication</td>
<td>87</td>
<td>57</td>
<td>102</td>
</tr>
<tr>
<td>Total language</td>
<td>86</td>
<td>53</td>
<td>99</td>
</tr>
<tr>
<td>Communication SS(VABS)* g</td>
<td>95</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>Socialization SS (VABS)* g</td>
<td>98</td>
<td>69</td>
<td>110</td>
</tr>
</tbody>
</table>

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childhood educators on the Social Interaction Assessment Scale can be found in Appendix B1. Abbreviated versions of these tables appear in the articles in Chapters 3 and 4 of this dissertation. A brief description of each child with ASD follows.

Lily was a 4-year 8-month old child who attended an integrated childcare centre. Responses to the parent questionnaire revealed that Lily was an only child, living with both her parents who were born and educated in China. The family immigrated to Canada when Lily was 18 months old. Both parents had a university education: Lily’s father was pursuing his Master’s degree at the time of this study; her mother was employed as a personal support worker. Mandarin was initially spoken in the home, but after Lily began attending childcare full time, at the age of 3 years and 7 months, her parents began speaking to her in English. Lily’s composite score on the Leiter-R Brief IQ Screener (Royd & Miller, 1997), displayed in Table 1, indicated non-verbal cognitive abilities at the high end of the average range for her age. From my observations in the childcare centre, it appeared that Lily was an easy-going child who had no difficulties with transitions between activities or change of programming. She appeared to like spending time in gross motor activities such as running or jumping repetitively. Observation of her play indicated that she preferred solitary play and that she would sometimes engage in parallel play or in group activities when her educators set them up specifically and monitored them. Lily’s standard score of 98 on the Socialization Domain of the VABS (Sparrow, Balla and Cichetti, 1984) implied that her adaptive social skills were well within the normal range. However, the early childhood educator evaluated Lily’s overall interaction skills below the level expected for her age. Lily’s language skills, as measured by the PLS-4 (Zimmerman, Steiner & Pond, 2002), were at the lower end of the average range, with standard scores of 87 for both Auditory Comprehension and Expressive Communication, and a Total Language standard score of 86. Lily’s standard score of 95 on the Communication Domain of the VABS suggests that her
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functional communication skills were well within the average range. However, my observation, which was confirmed by the early childhood educator’s report, indicated that Lily communicated mainly with the adults in the childcare room rather than with her peers. Lily communicated primarily for requesting and commenting, used two- and three-word utterances, and often resorted to stereotypical repetitive phrases such as “oooh, accident”, for commenting. Her speech pattern was unusual in that she lacked variation in her tone and her rhythm was unnatural.

Lily was diagnosed with an Autism Spectrum Disorder at a Toronto hospital, by a team comprised of a psychological associate, a speech-language pathologist, and an occupational therapist, at the age of 4 years 1 month. Lily’s score of 16 on Module 2 of the ADOS (Lord, Rutter and DiLavore, 1999), displayed in Table 1, indicated numerous autistic features. In her report on the ADOS the psychological associate noted that Lily used “rehearsed” or “pre-learned” phrases that carried little real communicative value, and that Lily failed to converse reciprocally with others despite her language abilities. Lily’s score of 31 on the CARS (Schopler, Reichler, & Renner, 1986) supported the diagnosis of autism. One year prior to her involvement in this study, Lily had been referred to the preschool speech and language services and had attended two 8-week blocks of group therapy once a week with a break of 8 weeks between the two blocks. According to the preschool speech and language service report, intervention goals included increasing eye-contact and attention, expansion of communicative functions, and use of visual supports.

Jacob was a 4 year 1 month old child who attended an integrated childcare centre. Jacob lived at home with both parents and an aunt, as well as with a younger brother, who was also diagnosed with autism. Both parents were of Filipino origin, and although they reported speaking Tagalog between themselves, English was the primary language spoken to the children in the home. Jacob’s mother had a university education and his father was a high-school graduate. At
the time of this study, Jacob’s father worked as a production line supervisor, and his mother was a homemaker. Jacob began attending childcare on a full time basis at the age of 2 years 11 months. His composite score on the Leiter-R Brief IQ Screener (Royd & Miller, 1997), displayed in Table 1, indicated that Jacob’s non-verbal cognitive abilities fell within the average range. My observation in the childcare centre prior to beginning this study revealed that Jacob was a very active boy who, when left to his own devices, enjoyed running in circles around the childcare room. Jacob engaged primarily in solitary play, although he was able to play alongside other children. He followed familiar routines in the childcare program (e.g., story-time, preparing to go outdoors) and particularly enjoyed the music circle. Jacob’s standard score of 69 on the Socialization Domain of the VABS (Sparrow, Balla and Cichetti, 1984) indicated that his adaptive social skills were in the delayed range for his age. Jacob’s language skills were evaluated using the PLS-4 (Zimmerman, Steiner & Pond, 2002) and were found to be in the severely delayed range for his age (Table 1). Jacob achieved standard scores of 55 and 60 for Auditory Comprehension and Expressive Communication, respectively, and a Total Language standard score of 53. Jacob’s performance on the Auditory Comprehension scale revealed that he did not follow two-step related directions and had difficulty demonstrating comprehension of spatial concepts and simple adjectives. His performance on the Expressive Communication scale demonstrated that he used single- and two-word utterances, with a limited range of functions, mainly to request and occasionally to label or comment. Jacob’s standard score of 60 on the Communication Domain of the VABS was consistent with the PLS-4 scores, and confirmed significant delays in communication. Jacob was diagnosed with autism by a developmental paediatrician at the age of 3 years. This diagnosis was corroborated by the team at a Child Development Clinic at a Toronto hospital, at the age of 3 years and 9 months. Jacob’s score of 15 on Module 1 of the ADOS (Lord, Rutter and DiLavore, 1999), displayed in Table 1, indicates
that he had many autistic features. In the ADOS report it was noted that Jacob rarely directed communication to others; he used stereotyped and idiosyncratic words and phrases; he had unusual eye-contact; and he rarely initiated joint attention. Jacob’s score of 33 on the CARS (Schopler, Reichler, & Renner, 1986) was consistent with his diagnosis of autism. Jacob’s parents reported that they had attended several training workshops aimed at teaching parents to facilitate language and social development in children with Autism Spectrum Disorder. Also, immediately prior to this study, Jacob had participated in one block of eight weekly sessions of group language intervention from a preschool speech and language service. As documented in reports from the preschool speech and language service, intervention goals for this therapy had focused on expansion of communicative functions and development of social communication skills.

Joey was 5 years and 1 month old at the time of his participation in this study. Joey lived at home with his parents and his typically developing 2 year old brother. Both parents were Caucasian and only English was spoken in the home. Both Joey’s parents were university graduates. Joey’s father worked as a business analyst and his mother was a teacher. Joey began attending a regular full-time childcare program in York Region when he was 4 years old. Joey’s non-verbal cognitive skills were in the above average range, as evidenced by his score on the Brief IQ Screener of the Leiter-R (Royd & Miller, 1997). Joey’s early childhood educator described him as a child who engaged primarily in solitary play. She reported that during free-play time outside he tended to run laps around the playground, and this was corroborated by my observations at the childcare centre. Joey enjoyed computer time and his educators often paired him with another child for this activity. Joey’s standard score on the Socialization Domain of the VABS (Sparrow, Balla and Cichetti, 1984) indicated that his adaptive social skills were in the average range for his age, but according to the early childhood educator, his ability to interact
well with his peers was less than that of a typically developing child. Joey’s receptive and expressive language skills, displayed in Table 1, were evaluated using the PLS-4 (Zimmerman, Steiner & Pond, 2002). Joey achieved standard scores of 95 and 102 for Auditory Comprehension and Expressive Communication respectively. His Total Language standard score was 99. However, Joey’s standard score of 90 on the Communication Domain of the VABS, displayed in Table 1, suggests that despite well-established language skills, Joey’s functional communication was less developed. My observations confirmed that Joey’s use of language was atypical in that many of his utterances were very frequently not directed at anyone in particular and were not communicative in nature. During solitary play Joey tended to describe play sequences to himself in a very quiet voice. Interactive utterances made during play were almost exclusively requests. In addition, Joey tended to speak very rapidly, and many of his utterances were unintelligible. When he was four years old, Joey was referred to a speech language pathologist at a preschool speech and language service for a speech and language assessment. In conversation with Joey’s mother, she reported that he was initially diagnosed with a mild delay in expressive and receptive language skills, and “concerns regarding clarity of his speech and social use of language”. At the age of 4 years 7 months Joey was diagnosed with Autism Spectrum Disorder by a psychological associate at a Child Development Clinic at a hospital in Toronto. Joey’s score of 11 on Module 2 of the ADOS (Lord, Rutter and DiLavore, 1999), displayed in Table 1, confirmed the presence of several autistic features. According to the ADOS report, most remarkable of these were his restricted conversational routines and his insistence on engaging with others around his own interests. Joey’s score of 31 on the CARS (Schopler, Reichler, & Renner, 1986) confirmed his diagnosis of Autism Spectrum Disorder. Between his 4th and 5th birthday, Joey had participated in 16 individual sessions and eight group sessions of intervention from a preschool speech and language service. According to the preschool speech
and language service report, intervention goals had included development of expressive language, articulation and pragmatic skills.

Typically developing peers. Three peer interventionists for each child with ASD were nominated by the early childhood educators to participate in this study. Two of these were randomly chosen to be trained as peer interventionists. The third peer was not trained and was involved in the study only for the purpose of collecting data regarding the generalization of skills across peers. Table 2 displays the demographic information and test scores for all selected peers. The pre-intervention ratings for these children on the Social Interaction Assessment Scale can be found in Appendix B2. The following descriptions of these children are based on the demographic questionnaires, the early childhood educators report, and on my observations in the childcare centre prior to beginning the intervention.

Lily’s peers were three girls ranging in age from 4 years to 5 years 3 months. Peer 1, Olga, was a very verbal, assertive child. She enjoyed taking charge during play with her peers and she often assumed the role of play-organizer. Peer 2, Shanika, was more shy and reserved. However, as per her assessment by the early childhood educator, she responded well to peer initiations, shared play materials, took turns while playing, and often engaged in extended play interactions. At 5 years 3 months, the untrained peer, Jennifer, was older than Lily’s other peers. Jennifer was a talkative child who interacted well with her peers and often initiated interactions with them. All three children spoke English at home. However, Olga’s parents also spoke to her in Russian and Azerbaijani, and Shanika’s mother occasionally spoke to her in Yoruba. All three children had been attending the childcare centre for at least 18 months prior to the beginning of the study.
Table 2

*Characteristics of typically developing peers included in the study*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Lily’s Peers</th>
<th>Jacob’s Peers</th>
<th>Joey’s Peers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1  P2  P3</td>
<td>P1  P2  P3</td>
<td>P1  P2  P3</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>4;0  4;7  5;3</td>
<td>4;11  5;4  3;8</td>
<td>5;6  4;9  4;9</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>F    F    F</td>
<td>F    M    F</td>
<td>M    F    M</td>
</tr>
<tr>
<td>Months attending childcare</td>
<td>18   24   30</td>
<td>24   30   12</td>
<td>24   24   24</td>
</tr>
<tr>
<td>prior to study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Language SS (PLS-4)</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>106  104  109</td>
<td>109  113  102</td>
<td>107  125  101</td>
</tr>
<tr>
<td>Expressive Communication</td>
<td>107  95   102</td>
<td>106  108  121</td>
<td>101  119  119</td>
</tr>
<tr>
<td>Total Language</td>
<td>107  100  106</td>
<td>108  112  112</td>
<td>105  125  111</td>
</tr>
</tbody>
</table>

*Note.* All names used are pseudonyms.* Standard scores on The Preschool Language Scales – 4th ed. (PLS-4) (Zimmerman, Steiner & Pond, 2002).

Jacob’s peers were two girls and a boy who ranged in age from 3 years and 8 months to 5 years and 4 months. Peer 1, Alia, was a lively girl who had often played with Jacob. According to the early childhood educator Alia interacted very well with her peers, regularly initiated cooperative play, responded to play invitations, and engaged in extended interactions with her peers. In addition, she was repeatedly sought as a play partner by other children in the childcare centre. Peer 2, Isaac, appeared to be a quiet boy with strong imaginative play skills. He interacted well with his peers and was also often sought as a play partner by other children in the childcare centre.
centre. The untrained peer, Sarah, at 3 years and 8 months, was younger than Jacob and his two other peers. Sarah often engaged with Jacob in play that involved gross motor activities. All three peers spoke both English and Amharic at home, and had been attending the childcare centre for at least one year prior to the beginning of this study.

Joey’s peers were two boys and a girl ranging in age from 4 years 9 months to 5 years 6 months. Peer 1, Julio, was a friendly and gregarious boy, who engaged often in activities such as dramatic play with soldiers or cowboys. Julio interacted well with his peers, responded to play invitations, shared play materials, took turns while playing and engaged in extended interactions with his peers. Peer 2, Carmen, appeared to be a patient child who interacted well with her peers, and was persistent in engaging them in play. Mike, the untrained peer, was Carmen’s twin brother. He presented as a quiet child with well-developed play abilities. Mike typically responded to play invitations, shared play materials, took turns while playing and engaged in extended interactions with his peers. Joey’s peers all spoke only English at home, and had been attending the childcare centre for two years prior to the beginning of this study.

*Early Childhood Educators.* Three early childhood educators (one for each of the three subjects) participated in this program. Table 3 displays the demographic information that was obtained from the early childhood educators prior to their participation in this research. All the early childhood educators had completed post-secondary education, and each had a 2-year college diploma in early childhood education that had been earned at a Canadian institution. Lily’s early childhood educator had also obtained an undergraduate degree from a university in her country of origin. All the early childhood educators held the primary position of responsibility for curriculum planning for the child with ASD in the classroom. Each of the early childhood educators had at least two years’ experience with preschoolers in the childcare setting.
and at least six months experience with a child with special needs. In addition, all the early childhood educators possessed good spoken English skills and had signed consent forms agreeing to be participants in this study.

Setting

All sessions took place in the child care centre. The early childhood educator sessions were held in the staff room. The social skills training sessions and all baseline, implementation and maintenance/generalization sessions took place in the preschool room. The preschool room
was furnished in a typical fashion, containing a carpet, child-height tables and chairs, bookshelves, bins with preschool toys and craft materials.

**Materials**

During the early childhood educator training meetings, each early childhood educator received a copy of the Intervention Manual (Appendix C). This document provides an overview of the theoretical foundation of the intervention program, a description of the intervention, clear instructions for each of the phases of the intervention, and specific scripts to be used during the intervention. (A summary of the materials for the early childhood educator training meetings and each of the phases of the intervention and the data collection can be found in Appendix C1). Each early childhood educator also received a copy of the book “Franklin’s New Friend” (Bourgeois, 1997), the modifications to the Franklin script (Appendix C2), and the Social Skills Picture Boards 1 and 2 (Figure 2, Figure 3) that were to be used in the intervention.

The book “Franklin’s New Friend” (Bourgeois, 1997), was chosen because the story addresses the themes of friendship, peer interactions and peer support, and these themes are intrinsic to the social skills training. In this book, Franklin, a turtle, befriends Moose, who is new in town. Initially, Franklin is afraid of Moose because he is so large. Franklin’s teacher suggests specific strategies to approach Moose, and Franklin learns that despite being so different from Moose, they can be friends. The story pinpoints the difficulties that may arise from being different from one’s peers, and emphasizes the many ways in which one can connect with peers in order to develop a relationship. Specific modifications to “Franklin’s New Friend” (Bourgeois, 1997) (Appendix C2) were incorporated in the Intervention Manual.

Social Skills Picture Boards 1 and 2 (Figure 2, Figure 3) were used during the social skills training sessions and during the implementation sessions. I developed these picture boards
Figure 2. Social skills picture board depicting strategies for initiation of interactions.
Figure 3. Social skills picture board depicting strategies for maintenance of interactions.
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using Boardmaker - Picture Communication Symbols computer program (Mayer-Johnson Co., 1995), which incorporates simple, clear graphics that are easily recognizable. The pictures in Social Skills Picture Board #1 were chosen to depict strategies that children could use in order to initiate interactions with their peers (English, Goldstein, Shafer, & Kaczmarek, 1997; Kohler, Strain & Shearer, 1992; Strain & Odom, 1986). The five strategies chosen were “I want to play”; “Please help”; “Come play”; “Give a toy”; and “Tap the shoulder”. Pictures in Social Skills Picture Board #2 were chosen to depict strategies that could extend and maintain social interactions (Conroy & Brown, 2002). The five strategies incorporated in this picture board were “Let’s play more”; “Good job!”; “My turn/your turn”; “Do it again”; and “I like that!”.

Also, in order to reinforce the strategies learned, each of the 10 picture prompts in Boards #1 and #2 was depicted on a 9cm x 9cm card. These cards were used in matching games (e.g., “Find the picture on the board that is the same as the one on the card.”) during the social skills training and implementation sessions.

Two puppets representing Franklin and two representing Moose were also employed during the social skills training sessions. In addition, in order to practice the strategies taught during the sessions, the children were given toys that are commonly found in preschool settings. Specifically, they were given four matchbox toy cars, eight wooden blocks, and a lift-out Franklin peg puzzle with five pieces.

In each baseline, implementation and maintenance/generalization session two play contexts were used: playdough and blocks. These two play contexts were chosen in order to emulate different types of play that occur with peers in the naturalistic setting of childcare centres. Play dough and blocks are commonly found in preschool settings (Raab, 2003), and both have been described as favoured activities by preschoolers (Farrell, Tayler, & Tennent, 2002).
For the playdough play context, the children were given two 5-ounce cans of playdough in primary colours. In addition, the children were provided with utensils to use with the playdough: a rolling pin, a plastic knife and fork, a set of measuring spoons, a pizza-cutter, two plastic plates, five molds, and four plastic cup-cakes. For the block play context, the children were given a large bag of Mega Bloks© containing 80 interlocking building blocks in bright primary colors. In addition, the children were given Mega Blok© figures from a castle set (king, queen, dragon, ghost, and knight) and from a farm set (farmer, boy, girl, chicken, and cow). For the implementation and maintenance/ generalization sessions, the children were also provided with the social skills picture boards and cards described above.

**Intervention**

The next section details the intervention program which consisted of four consecutive parts: (a) two early childhood educator (ECE) training meetings that took place prior to baseline measurement, (b) five half-hour social skills training sessions of the children with ASD and peers, (c) the implementation phase of the program, and (d) four follow-up and support meetings with the early childhood educators, following the implementation of the program.

**Early Childhood Educator Training.** Two early childhood educator training sessions were provided. During these sessions I discussed the fact that children with ASD have difficulties with social interaction and social communication, and explained that typically developing peers have been successfully incorporated into intervention programs for children with these deficits. I then provided an outline of the proposed intervention, clarified the collaborative nature of this intervention and emphasized the critical role that early childhood educators have in facilitating social communication intervention in the classroom (Brown & Conroy, 2002; Hundert & Houghton, 1992; McEvoy et al., 1992; Utley, Mortweet, & Greenwood, 1997). We then we
reviewed the Intervention Manual (Appendix C); the children’s story book “Franklin’s New Friend” (Bourgeois, 1997); the Social Skills Picture Boards 1 and 2 (Figure 2, Figure 3); and the specific scripts to be used during the intervention sessions (Appendices C3, C4).

*Social skills training program.* In the period immediately following baseline, the social skills training program was delivered in five half-hour sessions for each child with ASD and his/her two interventionists. Each of the children with ASD and his/her peer interventionists participated in all five sessions, which I led jointly with the early childhood educator. The social skills training program sessions are detailed in the Intervention Manual Appendix C5.

The training program involved the following steps: (a) I read “Franklin’s New Friend” (Bourgeois, 1997) to the group, (b) each child was given an opportunity to reenact the Franklin story using Franklin and Moose puppets as props, (c) the early childhood educator and I taught the children strategies to initiate and maintain social interaction using the Social Skills Picture Boards 1 and 2 (Figure 2, Figure 3), and (d) the early childhood educator and I asked the children to practice the strategies learned with one another, and provided them feedback.

*Implementation phase.* After the social skills training sessions, the implementation phase of the intervention took place. This phase lasted four weeks for Lily and for Jacob. Due to scheduling problems at the childcare centre, the implementation phase lasted five weeks for Joey. The objective of the implementation phase was to allow the children an opportunity to apply the social interaction skills that they had learned in the social skills training sessions. During this phase, each child with ASD participated in an implementation session with one of his/her typically developing peer interventionists three times a week for four weeks (i.e., twelve times in total), equaling six times with each peer.\(^3\) For each child with ASD, the first peer invited

\(^3\) Lily participated in six implementation sessions with Peer 1, Olga. However, Peer 2, Shanika, left on vacation unexpectedly and Lily had only five implementation sessions with her.
to the first implementation session was chosen randomly. The peers then alternated. In each session, the children were directed to play for a total of 20 minutes: 10 minutes with playdough and 10 minutes with block play. The first context for the first session was chosen randomly, and the first contexts for subsequent sessions alternated. This assured counterbalance in the order of peers and contexts. During these sessions, the ECE was responsible for providing the children with prompts and praise as specified in the Intervention manual (Appendix C4).

Follow-up and support meetings. Following the implementation phase, a break of several weeks was introduced, during which I did not visit the childcare centre. This break lasted for 4 weeks for Lily and Jacob, 5 weeks for Joey. During this period the early childhood educator was asked to continue to follow the schedule employed during the implementation phase. That is, the early childhood educator was asked to continue pairing the child with ASD with a trained typically developing peer for specific play times three times a week. I held four telephone meetings with the early childhood educators spread over the break, in order to answer questions and provide support for the continuation of the intervention.

Treatment Fidelity

To ensure that the intervention was conducted as planned for the three children with ASD and their typically developing peers, the following procedures were implemented. For the social skills training sessions, scripted intervention procedures were used to ensure that instruction was administered consistently (e.g., scripts for invitation to participate in the individual sessions, Appendix C3). In addition, a checklist was developed that corresponded to the key points that were targeted during each social skills training session (Appendix C6). At the end of each social skills training session, I completed the checklist with the early childhood educator. The findings are reported in Chapter 3 of this dissertation.
Data Collection

A summary of the schedule for data collection is outlined in Table 4. During the pre-intervention phase, data were collected using the independent measures described above. Also during this phase, videotaped data of the child interactions during baseline were collected. These data were collected for each child in 20-minute sessions with each of the two typically developing peers. During baseline, the children played without direction or prompts from adults.

During the intervention phase of the program, fidelity data and videotaped interaction data were collected. In order to collect the fidelity data, after each social skills training session the ECE and I completed a checklist that verified that all selected topics were targeted during each of the five training sessions (Appendix C6). Videotaped interaction data were collected as follows: each child with ASD participated in a total of six 20-minute implementation play sessions with each of the trained peers that were videotaped. These sessions were supervised by the ECE while I filmed the children’s interactions and took place three times a week for 4 weeks. Sessions were conducted in the children’s classrooms while the other children in the centre were engaged elsewhere. During each of these implementation play sessions, the ECE invited the child with ASD and one trained peer to play together and remained present to facilitate the 20-minute play interaction. The ECE also prompted and praised the children according to the schedule in Appendix C4.

Finally, during the post-intervention phase, child interaction maintenance and generalization data were collected. Four to five weeks after the implementation sessions were completed, two 20-minute play sessions of each child with ASD with each trained peer and one 20-minute play session with an untrained peer were videotaped. Maintenance and generalization
Table 4

Collection of independent and dependent measures

<table>
<thead>
<tr>
<th>Measures/materials</th>
<th>Participants</th>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>1 Pre-intervention: Independent measures</td>
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<td></td>
</tr>
<tr>
<td>ADOS</td>
<td>Psychologists/developmental paediatricians</td>
<td>Child with ASD</td>
</tr>
<tr>
<td>Case History Questionnaire</td>
<td>Parents of all participating children</td>
<td>Child with ASD Typically developing peers</td>
</tr>
<tr>
<td>PLS-4</td>
<td>Interventionist^4</td>
<td>Child with ASD Typically developing peers</td>
</tr>
<tr>
<td>Leiter</td>
<td>Interventionist</td>
<td>Child with ASD</td>
</tr>
<tr>
<td>CARS (observation in classroom)</td>
<td>Interventionist</td>
<td>Child with ASD</td>
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<td>ECE Information Form</td>
<td>ECE</td>
<td>ECE</td>
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<tr>
<td>Vineland</td>
<td>ECE</td>
<td>Child with ASD</td>
</tr>
<tr>
<td>Social Interaction Assessment Scale</td>
<td>ECE</td>
<td>Child with ASD Typically developing peers</td>
</tr>
<tr>
<td>Pre-intervention: Baseline videotaped play sessions</td>
<td>Child with ASD One typically developing peer</td>
<td>Child with ASD Typically developing peer</td>
</tr>
<tr>
<td>Camcorder</td>
<td>ECE and interventionist</td>
<td>Topics covered in each</td>
</tr>
</tbody>
</table>

^4 For this dissertation, I filled the role of SLP-interventionist, and of videographer.
Peer-mediated intervention training session

<table>
<thead>
<tr>
<th>Intervention: Implementation</th>
<th>Child with ASD</th>
<th>Child with ASD</th>
<th>One typically developing peer (trained)</th>
<th>Typically developing peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>videotaped play sessions</td>
<td>Camcorder</td>
<td>Coding system</td>
<td>Social skills picture boards and cards</td>
<td>ECE Videographer</td>
</tr>
<tr>
<td></td>
<td>Child with ASD</td>
<td>One typically developing peer (trained)</td>
<td>ECE Videographer</td>
<td></td>
</tr>
</tbody>
</table>

3 Post-Intervention: maintenance videotaped play sessions

<table>
<thead>
<tr>
<th>Child with ASD</th>
<th>Child with ASD</th>
<th>One typically developing peer (trained)</th>
<th>Typically developing peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camcorder</td>
<td>Coding system</td>
<td>Social skills picture boards and cards</td>
<td>ECE Videographer</td>
</tr>
<tr>
<td>Child with ASD</td>
<td>One typically developing peer (trained)</td>
<td>ECE Videographer</td>
<td></td>
</tr>
</tbody>
</table>

Post-Intervention: Generalization videotaped play sessions

<table>
<thead>
<tr>
<th>Child with ASD</th>
<th>Child with ASD</th>
<th>One typically developing peer (untrained)</th>
<th>Typically developing peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camcorder</td>
<td>Coding system</td>
<td>Social skills picture boards and cards</td>
<td>ECE Videographer</td>
</tr>
<tr>
<td>Child with ASD</td>
<td>One typically developing peer (untrained)</td>
<td>ECE Videographer</td>
<td></td>
</tr>
</tbody>
</table>

Post-intervention Social validity

<table>
<thead>
<tr>
<th>ECE, child with ASD; typically developing peers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE Evaluation</td>
</tr>
<tr>
<td>Child with ASD; typically developing peers</td>
</tr>
<tr>
<td>Independent Observer Evaluation</td>
</tr>
<tr>
<td>Five undergraduate students in a language development class</td>
</tr>
</tbody>
</table>

sessions were identical in format to baseline sessions: that is, the children were directed to play together without direction or prompts from adults. In addition, two types of social validity data were collected during this phase. First, ECE’s completed the Early Childhood Educator
Evaluation form (Appendix F) that was designed to evaluate their subjective views on the ease with which they could use the intervention in the classroom, and the probability that they would use the intervention in the future. Second, five independent persons observed these sessions, and completed the Independent Observer Evaluation form (Appendix F) that was designed to assess these observers’ views on the impact of the intervention.

In every data collection session that was videotaped (i.e., baseline, implementation, maintenance and generalization), the children were recorded for a total of 20 minutes in two different play contexts: 10 minutes with playdough and 10 minutes with block play. The order of the contexts was counterbalanced in that the first context for the first session was chosen randomly, and the first context for subsequent sessions alternated. In total, 42 ten-minute sessions were videotaped for Lily, 40 for Jacob, and 47 for Joey and their respective peers. A Panasonic Digital Camcorder with a built-in microphone (model # PV-DV601-K) was used to record all sessions.

Coding

Interactions between the children captured on the videotapes were coded using interval coding procedures (Bordens & Abbott, 1999). Interval coding was chosen over momentary time sampling since it allows continuous observation of the children’s behaviour through whole intervals and captures data that are generally representative of the children's interactions (Billingsley, Deitz, Tanta, & White, 2005). In order to facilitate interval coding, each of the 10-minute videotaped sessions was edited in the following manner. Each session was divided into 100 six-second intervals using Pinnacle Studio QuickStart video editing software (Dazzle Digital Video Creator, 2005), and four-second blank segments marking the beginning and end of each interval were inserted into the videotapes following each six-second interval.
A research assistant was recruited to code 60% of the videotaped data. In order to train the research assistant, four training videotapes were made with a typically developing peer who was not a participant in the study. Using the training videotapes, the research assistant practiced coding for the dependent variables, employing the Child Intervention Code (Appendix D). By the last two training tapes, the research assistant attained 100% agreement with my coding.

The videotapes were viewed and coded either by the research assistant or by me. The research assistant and I viewed the tapes and recorded codes onto a coding form (Appendix D1). Codes for interaction behaviours are described in the Child Intervention Code (Appendix D). These codes were combined into five dependent measures: initiations, responses, non-interactive behaviours, extended interactive engagement, and average length of extended interactions.

Initiations were defined as behaviours that start an interaction and which were not elicited or prompted by another child's behavior during the two immediately preceding 6-second intervals. Initiation codes included: play organizer (invitations to play, wherein a child specifies an activity, suggests a play idea, or directs another child to engage in an activity-related play behavior); share (offers of an object to, or request for an object from another child); assistance (offer or request for help); and negative initiations (actions or verbalizations that were uncomplimentary, rejecting, or physically harmful). Initiations were further subdivided by modality: non-verbal initiations, which included all intentional gestures and physical advances to the other child, and verbal initiations, which included all verbalizations directed to the other child. For the purposes of this study, all types of initiations were summed to yield one dependent measure that I called initiations.

A response was defined as a reaction to another child's initiation, if it took place within the two observational intervals immediately following the initiation. Four types of responses were scored: a passive response, where the child glances at/looks at peer briefly, or is actively
involved with the same object of focus or activity as his/her peer; a coordinated joint response, where the child is actively involved with and coordinates his/her attention to both the peer and the object that the peer is involved with; a verbal or gestural response, where the child offers a verbal or gestural response to a peer’s activity in the previous two observational intervals; and a negative response, which included all verbalizations or physical actions that were uncomplimentary, rejecting, or physically harmful in nature. Responses were further subdivided by modality: non-verbal responses, which included all intentional gestures and physical responses to the other child; and verbal responses, which included all verbalizations directed to the other child. For the purposes of this study, all types of responses were summed to yield one dependent measure that I called responses. Negative responses, which included all verbal or physical actions that are uncomplimentary, rejecting, or physically harmful in nature, were also recorded. Of the total initiations and responses scored across all three target children with their typically developing peers less than 1% were negative initiations, and less than 1% were negative responses. These initiations and responses were therefore not included in the total numbers of initiations and responses.

The third category, non-interactive behavior, was recorded when there was no evidence of engagement with the peer or with an object with which the peer was engaged. Three different non-interactive behaviours were scored: unitary, where the child with ASD was unoccupied, visually scanning the environment, or self-involved in motor activity to the exclusion of the peer; onlooker, where the child glanced briefly at peer or at an object with which the peer was engaged without a peer initiation; and unitary verbal, where the child talked to camera, to him/herself or to the room and no specific recipient of the message was apparent. For the purposes of this study, these three codes were summed to yield one dependent measure that I called non-interactive behavior.
The data regarding initiations and responses yielded information relating to two additional variables: extended interactive engagement, and average length of extended interactions. Extended interactive engagement was defined as an interaction that extended beyond the original initiation-response unit by at least one turn (Davis, Brady, Hamilton, McEvoy, & Williams, 1994). In other words, extended interactive engagement included all interactions of three or more non-interrupted turns between the two children. An interruption was defined as a further initiation or more than one 6 second interval during which no interaction occurred. The average length of the extended interactions was calculated by summing the length of all interactions with three turns or more and dividing by the total number of such interactions.

As mentioned above, using the blank segments as cues for the beginning and end of each interval, I (or my research assistant) recorded codes onto a coding form (Appendix D1) as the tapes were viewed. For each six-second interval, a single code was recorded for the interaction behaviour of each of the participating children. For example, if during an interval Lily gave a block to her peer, and the peer said “thank you” the observer would record a “non-verbal initiation” for Lily and a “verbal response” for her peer for that interval. Multiple occurrences of initiations or responses within the six-second interval were only counted once. For intervals during which two or more initiations or responses occurred, negatives took coding precedence over other types of interactions and verbal interactions took coding precedence over non-verbal interactions. When a child both initiated and responded during the same six-second interval, only an initiation was recorded. Hence, given a maximum of 100 intervals, each child could attain a maximum total of 100 codes.
Inter-rater Agreement

Inter-rater agreement measurements were taken in order to ensure the reliability of the data (Bordens & Abbott, 1999; Hegde, 1994). To this end, 20% of each child’s data in each phase (i.e., 20% of baseline sessions, 20% of implementation sessions and 20% of maintenance sessions for each child) was randomly selected and coded by the research assistant and by me. Reliability scores were calculated for each dependent variable namely, for initiations, responses, non-interactive behaviours, extended interactive engagement and length of extended interactions, as specified by Horner, Carr, Halle, McGee, & Wolery (2005), this measurement of inter-rater agreement allows for assessment of reliability “for each variable, across each participant, in each condition of the study” (p. 167).

Inter-rater reliability scores were calculated using point-by-point agreement. Point-by-point agreement is considered the most accurate method of estimating reliability when responses are scored using time interval coding procedures (Hegde, 1994; Kazdin, 1982). The advantage of this measure of reliability is that it provides an indication of consistency and accuracy when recording individual responses (McReynolds & Kearns, 1983). Point-by-point agreement was calculated by comparing the two raters’ coding on an interval-by-interval basis to determine the number of agreements and disagreements present for each behavior coded. Agreement for an interval was noted when both raters marked the same behavior (e.g., initiation) for a particular child in that interval. A disagreement was noted when raters recorded different behaviours (e.g., if I recorded an initiation and the research assistant recorded a non-interactive behavior) for a child in the same interval. Inter-rater agreement was calculated by dividing the number of agreements by the sum of the number of agreement and disagreements and multiplying by 100 (Hegde, 1994).
The percentage levels of inter-rater agreements for each child for each variable are depicted in Appendix E. The average reliability score is 85% for initiations; 89% for responses; 93% for non-interaction; 95% for extended interactive engagement; and 83% for the average length of extended interactions. The total average inter-rater reliability is 91%.

Social Validation

In order to assess their subjective views on the impact of the intervention, the ease with which they could use the intervention in the classroom, and the probability that they would use the intervention in the future, the early childhood educators were asked to complete a questionnaire (Appendix F), that evaluated the social validity of the intervention (Schwartz & Baer, 1991). The early childhood educators were asked to complete this questionnaire in my absence, and to leave the questionnaire in a sealed envelope for me to pick up the next day. The questionnaire consisted of seven statements (e.g., “I am able to teach peers to communicate with children with ASD in my classroom”; “I will be able to continue to implement this intervention independently”), using a 5-point Likert scale: 1 = not at all feasible/not at all/never, 3 = feasible to use some of the time/some benefit was noted/maybe, 5 = feasible to use nearly all the time/benefited a lot/definitely.

In order to remove the validation process from being the domain of potentially-biased parties and allow a “common sense” view, as opposed to a “scientific” or “professional” view, to be expressed, it has been suggested that unbiased, uninvolved observers evaluate whether changes in children’s behavior can be perceived (Hayes & Haas, 1988). To this end five undergraduate students in a language development class at a community college were asked to view 2-minute clips taken from the baseline and maintenance sessions of each target child. These students all had experience with young children and appeared well aware of what was considered
age-appropriate social behaviours. For each target child, one clip from a baseline session and one from a maintenance session with Peer 1 were randomly selected and then shown to the undergraduate students in random order (i.e., for each child the baseline and maintenance sessions were randomly ordered). The reviewers were blind to the experimental condition. That is, they were told that they will be shown two video segments separated by time, and they did not know that one of the segments was videotaped after an intervention. I gave the reviewers a questionnaire (Appendix F) that was designed to assess their views on the impact of the intervention by rating the overall interactions, rate of initiation, rate of response, sharing, turn-taking, and extended interactions, of the target children and their peers in the baseline and maintenance clips. The reviewers were given the definitions of “initiation”, “response” and “extended interaction” that were used in this study. After viewing the baseline and maintenance clip for each target child, the reviewers were asked to complete the questionnaire that consisted of six statements (e.g., “This child interacts well with peers”, “This child responds to play invitations”) using a 5-point Likert scale: with 1=not at all; 3=normal for age; 5=very often. A series of six nonparametric Wilcoxon Signed Ranks tests was conducted to examine the ratings for each item of the rating scale. The analyses compared the ratings between the baseline and maintenance sessions (Appendix F1).
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Peer-mediated intervention


CHAPTER 3

With kind permission from Sage Publications, this chapter was excerpted in its entirety from the following journal article:


This article can be found on the publisher’s website at http://tec.sagepub.com/content/33/3/133

A footnote in this chapter was added to the text following a supervisory committee meeting on June 9, 2014.

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The first author gratefully acknowledges Lisa Debow for her assistance with coding and reliability. A version of this paper was presented at the American Speech-Language-Hearing Association Convention, Miami, 2008. The data contained in this manuscript arise from a doctoral dissertation of the first author.
Peer-mediated intervention for preschoolers with ASD implemented in early childhood education settings

Abstract

The purpose of this study was to investigate the effects of peer intervention on the social interactions of children with ASD. In this model, a speech language pathologist and three early childhood educators trained typically developing peers to engage children with ASD in play. Three preschool children with ASD and six peers participated. The peer intervention took place in early childhood classrooms during play sessions with blocks and play dough. A single-subject multiple baseline design across subjects was used to determine the effects of the intervention. All three children with ASD demonstrated significant gains in the number and length of their interactions with peers, and maintained their gains. The results provided preliminary evidence supporting this model of intervention. Treatment fidelity and social validation measures are documented.

Keywords: peer interactions, autism spectrum disorder, preschoolers, peer-mediated intervention, single-subject design
This study focuses on preschool children diagnosed with autism spectrum disorder (ASD) and a peer-mediated model of intervention designed to improve their social interactions in early childhood education settings. Impairment in reciprocal social interaction is a core deficit in children with ASD. And increasingly, children with ASD are integrated into preschools and early childhood education classrooms where engaging in positive social interactions with their peers is an important developmental objective. One model of intervention that has a solid evidence base is peer-mediated intervention (see systematic reviews by Chan et al., 2009; Goldstein, Schneider, & Thiemann, 2007; Wang, Cui, & Parrila, 2011). Consequently, speech-language pathologists and early childhood educators involved in integrating children with ASD into their classrooms have looked to peer-mediated social interaction interventions to address the observed socialization deficits of these children.

Learning to interact positively with peers is an important social skill that is typically acquired during early childhood. However, observational studies indicate that children with ASD spend less time interacting with peers than typically developing children; have lower quality interactions when they play with peers; spend more time in purposeless play or inactivity; and maintain a greater physical distance from peers (Bass & Mulick, 2007; McGee, Feldman, & Morrier, 1997). Moreover, children with ASD appear to prefer solitary play and proximal onlooking (McConnell, 2002). When these children are placed in play groups with typical peers few or no peer interactions occur prior to intervention (e.g., Banda, Hart, & Liu-Gitz, 2010; Conroy, Boyd, Asmus, & Madera, 2007; Pierce-Jordan & Lifter, 2005; Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010; Wichnick, Vener, Pyrtek, & Poulson, 2010). Rotheram-Fuller et al. (2010) report that children with ASD have significantly fewer reciprocal relationships than their typically developing classmates. Facilitating the development of peer interaction skills in
Peer-mediated intervention

children with ASD who are integrated into preschools and child care centres is, therefore, an important objective.

Interventions currently used to promote peer interactions in child care settings include (a) manipulating environments, (b) prompting peer interactions, (c) training peer tutors, (d) direct skills training, and (e) comprehensive interventions that incorporate two or more of these interventions (Bass & Mulick, 2007; Chan et al., 2009; Goldstein et al., 2007; Wang et al., 2011). Systematic reviews supporting the efficacy of these interventions have been previously published (e.g., Bass & Mulick, 2007; Chan et al., 2009; Wang et al., 2011). Outcomes for peer-mediated interventions for children with ASD have generally been positive, but persistent problems with lack of treatment fidelity have been identified (Chan et al., 2009). Also, individuals training the children have either been research assistants directly involved in the research (e.g., Trembath, Balandin, Togher, & Stancliffe, 2009) or highly trained teachers (e.g., Banda et al., 2010; McCann Sawyer, Luiselli, Ricciardi, & Gower, 2005) who were provided with extensive consultation and support during the training, thereby escalating the cost of implementation.

Peer-mediated interventions typically use routine activities (Prizant, Wetherby, & Rydell, 2000) and promote development of age-appropriate social interactions as children interact with age-cohorts rather than with educators taking on the role of “playmates” (Kishida & Kemp, 2009). In peer-mediated intervention studies, typically-developing children are taught to engage children with ASD in positive and extended social interactions. Normally, children in these studies are preschool or school-age, with most participants being over 6 years of age (Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011; Matson, Matson, & Rivet, 2007; Wang et al., 2011; White, Keonig, & Scahill, 2007). In such studies, peer interventionists are trained to direct specific social strategies such as invitations to play, offers of assistance, offers to share, and
demonstrations of affection to children with ASD. These strategies are taught in small teacher-led groups, and teachers typically prompt the peer interventionists to use strategies during the play sessions (Bass & Mulick, 2007; Goldstein et al., 2007). These studies suggest that interventions that systematically teach peers to engage children with ASD in positive, playful activities may have substantial positive effects on their social skills. When trained peers employed initiation strategies children with ASD increased their positive responses to the social bids of their typically developing peers (Banda, Hart, & Liu-Gitz, 2010; Wichnick et al., 2010) played physically closer to their peers; and stayed longer in joint activities (Conroy, Boyd, Asmus, & Madera, 2007; Nelson, 2007). Hence, it appears that employing typically developing peers to facilitate social interactions in children with ASD may provide gains (Bass & Mulick, 2007; Goldstein, Schneider, & Thiemann, 2007; Wang et al., 2011).

Several studies have measured the frequency of interactions between children with ASD and their peer interventionists (Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008; Trembath, Balandin, Togher, & Stancliffe, 2009; Wichnick et al., 2010.), but only few have measured the length of these interactions (Conroy et al., 2007; Nelson, 2007). Licciardello, Harchik, & Luiselli (2008) highlight the importance of data on the length of interactive play to ensure that children with ASD are engaged in high quality interactions that maintain play across multiple turns. Brown & Conroy (2002) suggest that teaching peer interventionists strategies such as redirecting, prompting, and persisting is likely to facilitate longer interactions, and recommend further investigation to support this claim.

Fox, Hemmeter, Snyder, Binder, & Clarke (2011) emphasize the importance of supporting early childhood educators in implementing intervention practices that foster children’s social competence, suggesting that educators should participate in the training process
to ensure the acquisition and maintenance of interactive skills in natural settings (Goldstein et al., 2007; Hundert, 2007). These studies suggest that training educators to facilitate peer interaction during ongoing, naturalistic classroom activities is beneficial, providing the effectiveness and fidelity (Kaderavek & Justice, 2010; Wolery, 2011) of such interventions is monitored.

In the intervention presented in this study, a speech language pathologist and three early childhood educators trained typically developing peers to engage children with ASD in play. The current study was conducted in order to replicate and expand upon the findings of previous work by addressing two questions. The first question was whether, following the intervention, peer interventionists and target children with ASD engaged in more frequent and longer extended social interactions. The second question considered two measures of the social validity of the intervention (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi & Gower, 2005), namely whether the intervention is feasible within the context of a day care centre, and whether lay independent observers think that the intervention achieved an important social goal, defined as increases in the number and length of extended interactions.

Methods

Participants

Early childhood educators. Three early childhood educators participated in this study. The educators worked in three different child care centres and they all had a preschool-aged child with ASD integrated into their classrooms. All educators were female and each had at least five years of experience in child care. In addition, each educator had at least six months experience with a child who had special needs. All had all completed a 2-year college diploma in early childhood education and had primary responsibility for the classroom curriculum planning
for the child with ASD. All three educators had taken professional development courses in special education or in speech and language development, though these courses were not specific to autism.

*Children with ASD.* The characteristics of the three children with ASD, Lily, Jacob, and Joey, are summarized in Table 1. All three children were enrolled full time in child care, and their ages were between 4;1 to 5;1 years old. Their diagnosis of ASD had been made by an independent psychologist or developmental pediatrician using the Autism Diagnostic Observation Schedule (ADOS; Lord, Risi Lambrecht, Leventhal, DiLavore, Pickles, & Rutter, 2000). The first author also completed The Childhood Autism Rating Scale (CARS; Schopler, Reichler & Renner, 1988). The children’s non-verbal cognitive abilities were within normal limits as measured by the Brief IQ screener of the Leiter International Performance Scale–R (Roid & Miller, 1997). The Socialization and Communication domains of the Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984) for each child with ASD were completed by the early childhood educator. The language and socialization scores for Lily and Joey were within one standard deviation of the mean, whereas Jacob’s language and socialization standard scores were below two standard deviations from the mean.

Lily was 4 years 8 months old. Observation of her play indicated that she preferred solitary play and that she sometimes engaged in parallel play or in group activities when her educators set them up specifically and monitored them. She used two- and three-word utterances to communicate. In the child care room, Lily communicated mainly with the adults rather than with her peers. Observation indicated that Lily communicated primarily for requesting and commenting.
Table 1

*Characteristics of the Children with ASD*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Lily</th>
<th>Jacob</th>
<th>Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>4;8</td>
<td>4;1</td>
<td>5;1</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>Months attending child care prior to study</td>
<td>12 (full-time)</td>
<td>14 (full-time)</td>
<td>14 (full-time)</td>
</tr>
<tr>
<td>ADOSa score</td>
<td>16 (module 2)</td>
<td>15 (module 1)</td>
<td>11 (module 2)</td>
</tr>
<tr>
<td>CARSb score</td>
<td>31</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>IQ (Leiter)c</td>
<td>109</td>
<td>98</td>
<td>111</td>
</tr>
<tr>
<td>Language SS (PLS-4)d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>87</td>
<td>59</td>
<td>95</td>
</tr>
<tr>
<td>Expressive Communication</td>
<td>87</td>
<td>57</td>
<td>102</td>
</tr>
<tr>
<td>Socialization SS (VABS)e</td>
<td>98</td>
<td>69</td>
<td>110</td>
</tr>
</tbody>
</table>

Jacob was 4 years and 1 month of age. He engaged primarily in solitary play although he was able to play alongside other children. Jacob did not initiate interactions with his peers and according to his educators he did not respond to peer initiations as often as his typically developing peers. Furthermore, Jacob hardly ever shared play materials with peers and he did not take turns while playing. He used single- and two-word utterances, with a limited range of functions, mainly to request and occasionally to label or comment.

Joey was 5 years and 1 month old. His early childhood educator described him as a child who engaged primarily in solitary play. Joey did not initiate interactions with peers and did not take turns with his peers. He did not share toys readily and did not often engage in extended social interactions. Joey communicated using short sentences mainly to request or protest. During solitary play Joey tended to describe play sequences to himself in a very quiet voice.

*Typically developing peers.* Each of the three educators was asked to nominate two typically-developing peers as peer interventionists for the children with ASD. The criteria for selecting the peers were (a) typical language development, (b) typical social skills as described by the educators, (c) attendance in the same classroom as the child with ASD, and (d) previous interest in interacting with the child with ASD. The characteristics of the peer interventionists are included in Table 2.

*Settings and Materials*

The study took place in three licensed child care centres that integrated children with ASD into regular classrooms. The materials used in this study were an intervention manual (available from the first author on request), a story book (Franklin’s New Friend, Bourgeois,
Table 2

*Characteristics of the typically-developing peers*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Peers for Lily</th>
<th>Peers for Jacob</th>
<th>Peers for Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>4;0 4;7</td>
<td>4;11 5;4</td>
<td>5;6 4;9</td>
</tr>
<tr>
<td>Gender</td>
<td>F F</td>
<td>F M</td>
<td>M F</td>
</tr>
<tr>
<td>Language SS (PLS-4)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>106 104</td>
<td>109 113</td>
<td>107 125</td>
</tr>
<tr>
<td>Expressive Communication</td>
<td>107 95</td>
<td>106 108</td>
<td>101 119</td>
</tr>
</tbody>
</table>


1997), puppets of the two main characters in the book, Moose and Franklin, and two picture communication boards depicting interaction strategies designed to promote initiation or maintenance of play. The materials also included mega blocks with figures and vehicles and play dough with utensils (i.e., mixers, spatulas, cookie cutters, pizza cutter). These materials are typically available in preschool settings (Raab, 2003) and constitute favoured play materials in the naturalistic setting of childcare centres: (Farrell, Tayler & Tennent, 2002).

*Experimental Design*

A single-subject multiple baseline design across three participants was used to evaluate the effects of a peer-mediated intervention program on children’s extended interactions in
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naturalistic play sessions. The design incorporated non-concurrent multiple baselines (Watson & Workman, 1981), which allows for flexibility in applied research settings while maintaining the design parameters required for determining the validity of the relationship between treatment variables and behavior changes (e.g., Kamps et al., 1992; Koegel, Vernon, Koegel, Koegel, & Paullin, 2012). In this type of research design the researcher pre-determines the increasing length of each of the baseline phases. As subjects are recruited, they are randomly assigned to one of the pre-determined baseline lengths, and baseline measures are observed. All participants took part in a series of baseline sessions pre-intervention, followed by twelve 20-minute play sessions post-training, and then by four follow-up sessions. The length of baseline was chosen to facilitate completion of the study within a four month period to fit in with the schedule of the child care centres.

Procedures

Baseline. The 3 participants with ASD were randomly assigned to baselines of 2, 4, or 5 weeks. In a multiple baseline design, intervention is introduced in a staggered incremental time frame for each successive participant (Christ, 2007). Children assigned to baseline lengths of 2 and 4 weeks had 4 baseline data sessions, whereas the child who was assigned to 5 weeks had 6 baseline data sessions. A minimum of three baseline data points are required to establish stability (Byiers, Reichle, & Symons, 2012; Kazdin, 2010): in this study all three target children displayed stability of the measured behavior during the baseline phase. All baseline data sessions were scheduled at the beginning, mid-point and end of the baseline period. Baseline data were collected for each child in interaction with each of the two typically-developing peers, in two naturalistic play contexts (i.e., play dough, block play). For each child with ASD, the first peer to
be invited to the play session was chosen randomly. Thereafter, the order was counterbalanced. During baseline, the children played without direction or prompts from adults. Sessions were videotaped and each session lasted 20 minutes, that is, 10 minutes with blocks and 10 minutes with play dough.

**Intervention program.** The intervention program consisted of four consecutive stages: (a) two early childhood educator training sessions, (b) five half-hour social skills training sessions that were co-taught by the first author and the educators (c) twelve 20-minute play sessions during which the educators implemented the program and scaffolded children’s participation, and (d) four follow-up and support sessions with the early childhood educators.

The first stage consisted of two initial early childhood educator training sessions, which took place in the staff rooms at the child care centres, and in which the educators were informed of the procedures for this intervention. The first author gave educators an intervention manual, a story book, and two picture communication boards. The manual provided an overview of the intervention program, a description of the intervention, instructions for each of the stages of the intervention, and the specific scripts to be used during the intervention. The story book, Franklin’s New Friend (Bourgeois, 1997), was to be used to introduce children to the concept of playing together and to emphasize various ways of developing friendship. Specific modifications to the book were incorporated to encourage children’s verbal participation during the storybook reading activity, including cloze statements (e.g., “Franklin was scared, because Moose was so ……”), recall prompts (e.g., “What did Franklin say? He said:……”), and Wh-questions (e.g., “Who do you think made the poster?”). Educators also received two Social Skills Communication Boards that illustrated the social interaction strategies children could use to initiate or maintain play (Brown & Conroy, 2002) such as “Let’s play”, “My turn/your turn”, and “Do it again”.
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Each strategy was depicted on a 9cm x 9cm card for use as a visual aid during the sessions. Finally, the first author suggested feedback that could be used to engage the children in play interactions (e.g., “Joey is not playing with you. Ask him to help”, “Good asking for help, Lily”, “I like the way you gave Paul the car”).

The second stage of the intervention comprised of five consecutive half-hour social skills training sessions for all participating children (i.e., the target child with ASD and the two typically developing peers) that took place in a quiet room in the child care centre. These sessions were co-taught by the first author and an early childhood educator. The first two sessions involved reading the book, Franklin’s New Friend (Bourgeois, 1997), and giving each child an opportunity to reenact the story using puppets. The third and fourth sessions introduced strategies to initiate and maintain play interaction using the two communication boards. The children were provided with opportunities to practice using the strategies depicted on the communication boards. The final session in this stage was a review.

The third stage of the program consisted of twelve 20-minute play sessions that were supervised by the early childhood educator and took place three times a week for 4 weeks. The sessions, which were videotaped to collect data, were conducted in the children’s classrooms while the other children were engaged elsewhere, and consisted of 10 minutes of block play and 10 minutes with play dough (the order was counterbalanced). Each child with ASD participated in a total of six play sessions with each of the trained peers. During the play sessions, the educator invited the child with ASD and one trained peer to play together and remained present to facilitate the 20-minute play interaction. The educator began by using the two communication boards to review the social interaction strategies that the children had learned in the training sessions. During the play, the educator prompted the children to use a specific strategy on the
communication board (e.g., “Johnny, do you want a block? What can you say?”), whenever there was a period of approximately 30 seconds with no joint interaction. At the end of each 20-minute play session, the first author reviewed the children’s progress with the educator and provided the educator with feedback on her use of the communication boards.

The fourth stage of the program involved follow-up and support sessions for the early childhood educators. Specifically, after the 12 play sessions were completed, the early childhood educator was asked to continue pairing the child with ASD with a trained peer for specific play times three times a week. These sessions were not videotaped. The first author held four telephone meetings with the early childhood educators to answer questions and provide continued support.

*Maintenance.* Two 20-minute play sessions of each child with ASD with each trained peer were videotaped to collect data on the maintenance of social interaction skills, 4 – 5 weeks after the intervention was completed. Maintenance sessions were identical in format to the baseline sessions, except that the early childhood educator was asked not to prompt the children with the communication boards or to praise them.

*Data Collected*

*Extended interactions.* An interval coding system (Bordens & Abbott, 1999) was applied to all play sessions to measure the children’s engagement in the interaction. “Engagement” was defined in terms of the dyad's involvement in joint interaction using social cues of increasing sophistication such as smiling, looking in response to a request for attention, laughing with eye contact, vocalizing with eye contact, or verbalizing to the peer. The first author reviewed the videotapes and noted the presence/absence of joint interaction in every six second period for a
total of 200 intervals per 20 minute play session (play dough and blocks combined). The first dependent variable was extended interactive engagement, which was defined as an interaction that extended beyond the original initiation-response unit by at least one turn (Davis, Brady, Hamilton, McEvoy, & Williams, 1994). In other words, extended interactions included all interactions of three or more non-interrupted turns between the two children. An interruption was defined as a further initiation or more than one 6 second interval during which no interaction occurred. The second dependent variable was the average length of the extended interactions. This was calculated by summing the length of all interactions with three turns or more and dividing by the total number of such interactions.

Treatment fidelity. Using a checklist, treatment fidelity was measured for the five social skills training sessions to determine whether the intervention was administered consistently and in accordance with the manual. This was done after each training session.

Social validity. Social validity was measured in two ways. First, educators completed a questionnaire regarding their perceptions of the acceptability and feasibility of the intervention (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi, & Gower, 2005; Schwartz & Baer, 1991), and its impact on children’s interactions. Specifically, educators were asked to rate four statements on the questionnaire using a 5-point Likert scale (1 = not at all feasible/not at all/never, 3 = feasible to use some of the time/some benefit was noted/maybe, 5= feasible to use nearly all the time/ benefited a lot/definitely). Second, to determine whether the intervention addressed an important social goal, five undergraduate students in a language development class at a community college were asked to view 2-minute clips chosen randomly from the baseline and from maintenance sessions of each target child. The reviewers were not informed that one of the segments was videotaped after the intervention. The reviewers were given the definition of
“extended interaction” that was used in this study, and received a questionnaire that was designed to assess their views on the impact of the intervention by comparing the extended interactions of the target children and their peers in two clips.

**Interrater Agreement**

Interrater agreement was measured to ensure the reliability of the interval coding system. To this end, 20% of all play sessions were randomly selected and coded independently by the first author and a trained research assistant. Interrater reliability was determined using point-by-point agreement, which is considered an accurate estimate of reliability when responses are scored using time interval coding procedures (Hegde, 1994). The percentage agreement was 89.9% for the presence of joint interaction ($n = 1628$) and 95% for the absence of joint interaction ($n = 2295$).

Results

*Effects of Intervention on Extended Interactive Engagement*

Figure 1 presents the number of extended interactions between the typically developing peers and the target children during the baseline sessions, the six play sessions, and the maintenance sessions. The bar graphs in Figure 2 present the average lengths of the extended interactions between the target child and each of his/her peers during the play sessions. The effectiveness of the intervention was examined by visual inspection of the data and by

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1 The percentage agreement score for extended interactive engagement is 95%, and for the average length of extended interactions, 83%.
calculating the percentage of non-overlapping data points (PND), as described by Scruggs and Mastropieri (1998). PND scores are determined by calculating the percent of intervention data points that do not overlap with the highest baseline data point. Scruggs & Mastropieri, (1998) suggest that PND scores above 90 represent “very effective” intervention scores, scores from 70 - 90 represent “effective” interventions, scores from 50 - 70 are “questionable”, and scores below 50 are “ineffective”.

_Lily_. Inspection of the data in Figure 1 indicates that there was a slight increase in two of the four baseline measurements. Specifically, the number of extended interactions between Peer 1 and Lily were 4 and 5, whereas the number of extended interactions between Peer 2 and Lily were 1 and 4. During the play sessions the number of extended interactions increased significantly over baseline. Peer 1 and Lily increased the average number of extended interactions from 4.5 at baseline to 15.7 in the last three play sessions. Lily and Peer 2 increased their average number of extended interactions from 2.5 at baseline to 13.5 in the last two play sessions. During the maintenance sessions, Lily had 24 and 15 extended interactions with Peer 1, which represent an average increase of 15 extended interactions over 4.5 at baseline. Lily and Peer 2 had 10 and 22 extended interactions at maintenance, which represent an average increase of 13.5 over 2.5 at baseline. The percentage of nonoverlapping data (PND) was calculated for Lily and her peers. Lily and her peers achieved PND scores of 100% for both play and maintenance sessions, which is described as “a very effective intervention score” (Scruggs & Mastropieri, 1998).
Visual inspection of the data for Lily in Figure 2 indicates an increase in the average length of extended interactions between Lily and her peers from baseline to the play sessions. Specifically, during baseline, Lily’s extended interactions averaged approximately 4 turns with Peer 1 and 5 turns with Peer 2. During the last three play sessions the average length of Lily’s extended interactions increased to an average of approximately 8 turns with both peers. Lily
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Figure 2. Average number of turns in extended interactions between children with ASD and their typically developing peers.

further increased the length of interactions to an average of 14 turns for Peer 1 during maintenance. With Peer 2, the length of Lily’s extended interactions averaged 6 turns, below the average length achieved during the play sessions, but above the average for baseline sessions.

Jacob. During baseline the numbers of extended interactions with Peer 1 were 6 and 5, and the numbers of extended interactions with Peer 2 were 7 and 2. Jacob and his peers increased the number of extended interactions during the play sessions when compared to baseline. An exception to this was the third play session where Peer 2 was feeling unwell and needed frequent redirection. During the last three play sessions, Jacob and Peer 1 increased the number of extended interactions from an average of 5.5 at baseline to an average of 20.3 during the last
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three play sessions. This represents an average increase of approximately 15 extended interactions over baseline. Jacob and Peer 2 also increased the number of extended interactions from an average of 4.5 at baseline to an average of 20.3 during the last three play sessions. This represents an average increase of approximately 16 extended interactions over baseline. Peer 2 did not participate in the maintenance sessions because he had left the child care centre. During maintenance sessions with Peer 1, Jacob had 22 and 20 extended interactions which represent an average increase of 15.5 extended interactions from the average of 5.5 at baseline. The PND with Peer 1 was 100% for both play sessions and maintenance, which is “a very effective intervention score” (Scruggs & Mastropieri, 1998). With Peer 2, one of six play session data points overlapped with a baseline data point, giving him a PND score of 83%, which is an “effective” intervention (Scruggs & Mastropieri, 1998).

Inspection of the graphs in Figure 2 reveals that Jacob increased the average length of extended interactions with Peer 1 from baseline to the play sessions. The average length dropped marginally (compared to play sessions) in the maintenance period but was still much higher than at baseline. Specifically, the length of Jacob’s extended interactions with Peer 1 averaged four turns during baseline sessions. During the last three play sessions his extended interactions averaged 12 turns, and during the two maintenance sessions with Peer 1 the length of the extended interactions averaged 10 turns. With Peer 2, the average length of Jacob’s extended interactions remained constant, at nine turns for baseline and for the play sessions.

Joey. Baseline measurements for Joey and Peer 1 were taken three times over a 4-week period. Joey and Peer 2 participated in three play dough and two block play baseline sessions over a period of 5 weeks. Peer 2 was not available for the third baseline block session, and the data for this session were estimated by using the average number of extended interactions in the
first two baseline block sessions. During baseline sessions the number of extended interactions between Joey and Peer 1 were 0, 5, and 0, with an average of 1.6. The number of extended interactions between Joey and Peer 2 were 9, 13, and 10, with an average of 10.6. The number of extended interactions increased from baseline with both of his typically-developing peers during the play sessions. Specifically, during the last three play sessions, the number of extended interactions averaged 25 with Peer 1 and 22.6 with Peer 2. These figures represent increases of 23.4 extended interactions for Peer 1 (from a baseline average of 1.6) and an increase of 12 for Peer 2 (from a baseline average of 10.6). Maintenance sessions for Joey were videotaped twice with each peer. At maintenance, Joey and Peer 1 had 20 and 24 extended interactions which represent an average increase of 20.4 extended interactions from 1.6 at baseline. Joey and Peer 2 had 18 extended interactions during both maintenance sessions, which constitute an average increase of 7.4 extended interactions over the average baseline measure of 10.6. The percentage of nonoverlapping data (PND) was calculated for Joey’s peers. There was no overlap between baseline data points and the play sessions and maintenance data points (see Figure 1). Thus, both peers achieved PND scores of 100% for play sessions and maintenance, which is described as “a very effective intervention score” (Scruggs & Mastropieri, 1998).

The data depicted in Figure 2 demonstrate that the average length of Joey’s extended interactions at baseline was 6 turns with Peer 1 and 5 turns with Peer 2. Joey and both his peers increased the length of their extended interactions during the last three play sessions to 8 turns (with Peer 1) and 11 turns (with Peer 2). During maintenance sessions Joey and Peer 1 further increased the average length of their extended interactions to 12 turns. The average length of the extended interactions between Joey and Peer 2 during maintenance sessions was 8 turns, which was well above the baseline average of 5 turns.
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_Fidelity of Implementation_

Treatment fidelity was measured with five checklists that examined the content taught in each of the social skills training sessions. These checklists were completed jointly by the first author and the early childhood educators immediately after each session, yielding five checklists across three groups of children (i.e., 15 checklists). The results revealed 100% compliance in all five social skills training sessions, indicating that the training sessions were delivered consistently to all children.

_Social Validity of Treatment Gains_

Two types of social validity were considered (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi & Gower, 2005). First, educators evaluated the social validity of the intervention program, namely whether the intervention is feasible within the context of a child care centre, by completing a post-program questionnaire that asked them to rate four statements using a 5-point Likert scale: 1 = not at all/never; 5 = all the time/a lot/definitely. The educators assigned mean ratings of 4.0 – 5.0 to all statements. These ratings indicated that the educators who participated in the study were able to teach peers to communicate with children with ASD in the classroom and could continue to implement the intervention strategies independently in their programs. The educators also reported that in their view the target child benefitted from the intervention and confirmed that they would use the intervention again in their classrooms.

An important issue concerns the second aspect of social validity that is whether the intervention achieved an important social goal. In general, the literature suggests that this aspect of the social validity of the intervention should be judged by independent lay observers (Hayes & Haas, 1988; McCann Sawyer, Luiselli, Ricciardo & Gower, 2005). Doing this removes the
validation process from being the domain of potentially-biased parties and allows for a “common sense” view, as opposed to a “scientific”/”professional” view. To put this into effect, five undergraduate students in a language development class at a community college were asked to view 2-minute clips taken from the baseline and maintenance sessions of each target child. For each target child, one clip from a baseline session and one from a maintenance session with Peer 1 were randomly selected and then shown to the undergraduate students in random order (i.e., for each child the baseline and maintenance sessions were randomly ordered). The reviewers were blind to the temporal sequence of the clips: while they were told that they will be shown two video segments separated by an intervention, they were not told which of the two clips came before/after the intervention. The reviewers were given the definition “extended interaction” that was used in this study. After viewing the baseline and maintenance clip for each target child, reviewers were asked to complete a questionnaire that consisted of three statements, using a 5-point Likert scale: 1=very low/not at all/ 3=normal for age, 5=very high/very often (see Table 3).

Results of the questionnaire are presented in Table 3. For each target child the observers found that the target children took turns and engaged in extended interactions more frequently at maintenance than at baseline. Specifically, ratings were as follows: For Lily, ratings at maintenance ranged between 2.8 and 3 (“normal for her age”) for interactions, turn-taking and extended interactions (compared with 1, “very low/not at all” for baseline). For Jacob ratings at maintenance ranged from 3.8 – 4.4 (between “normal for his age” and “very high”) for interactions, turn-taking and extended interactions (compared with 1 – 1.2, “very low/not at all” for baseline). And for Joey, ratings at maintenance ranged between 4.2 and 4.6 (between “normal for his age” and “very high”) for interactions, turn-taking and extended interactions (compared with 1 – 1.2, “very low/not at all” for baseline). To sum up, the unanimous
Peer-mediated intervention

Table 3.

*Means of Pre- and Post-Intervention Ratings on the Social Interaction Assessment Scale (adapted from McConnell and Odom, 1999) by Five Unbiased, Uninvolved Observers*

<table>
<thead>
<tr>
<th>Target children</th>
<th>Interacts well with peers</th>
<th>Takes turns while playing</th>
<th>Engages in extended interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>LILY -pre</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>JACOB -pre</td>
<td>1.2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3.8</td>
<td>4.4</td>
<td>4</td>
</tr>
<tr>
<td>JOEY -pre</td>
<td>1.2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4.2</td>
<td>4.6</td>
<td>4.6</td>
</tr>
</tbody>
</table>

*Note.* Pre=pretest; Post=posttest. Questions were rated on a 5-point Likert scale, with 1=not at all; 3=normal for age; 5=very often.

judgement of the lay observers was that performance was higher in the maintenance clip than in the baseline clip for each target child, thus providing external validation of a treatment effect.

Discussion

This study examined the effectiveness of a peer-mediated social intervention for three preschoolers with ASD, and its findings were both important and encouraging. Primarily, the intervention improved the social engagement of the children with ASD in the study. Specifically, all three children with ASD substantially improved the number and lengths of their extended interactions during play sessions with two typically developing trained peers. Moreover, the children with ASD maintained these gains in a maintenance test held 4 to 5 weeks after the intervention was completed.
The observed increases in extended interactions confirm and expand upon the findings of prior intervention studies that use peer interventionists to promote children’s social interaction skills (Banda et al., 2010; Keen, Sigafoos, & Woodyatt, 2001; Kohler et al., 2007). Only a few of these earlier studies looked at the length of extended interactions (Conroy et al., 2007; Nelson, 2007). The finding in the current study that the children with ASD increased the length of their extended interactions is significant because it captures the quality of children’s interactions that are maintained across multiple turns (Licciardello, Harchik, & Luiselli, 2008).

Furthermore, the maintenance of children’s newly learned behaviour has not been extensively documented (see Banda et al., 2010; Keen et al., 2001). The current study finds that the three children with ASD maintained their gains in social interactions following training. These findings are important because children with ASD who engage more frequently in interactions elicit more linguistic and social feedback from their peers from which they can learn (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010). In other words, the intervention may create a virtuous cycle.

A few words concerning the social validity of the peer intervention. Social validity is important because subjective evaluations complement the objective measures of treatment outcome (Foster & Mash, 1999). And yet, Matson et al. (2007) reviewed 79 social skills intervention studies and reported that fewer than 10% of these studies evaluated social validity. In the current study, two types of social validity of the intervention were considered. First, whether the intervention is feasible within the context of a day care centre. And second, whether, in the opinion of lay, independent observers, the intervention achieves an important social goal (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi & Gower, 2005), which was defined as an increase in extended interactions.
Several limitations and future research directions should be noted. First, this study involved three children with ASD in a specific context and it is important to determine whether the success of the intervention can be replicated with other children with ASD in similar and/or other contexts. Also, the specific characteristics of the children in this sample may limit the extent to which the findings of this study may be generalized. Future studies might focus on younger children with ASD or children with concomitant cognitive deficits. As more children participate in the intervention, the treatment manual may be refined to reflect the different types of participants. Further, more than one educator or educational assistant is typically present in each classroom. Hence, it may be useful for future studies to engage all the target child’s caregivers. This may support the generalization of strategies across adults and contexts within the early childhood education setting. Further development of this intervention model may also extend to the children’s parents since they are generally well positioned to implement play sessions with the target child’s siblings and/or peers in the home setting. In addition, future research may address an intervention model where children with ASD and their trained peers are able to choose toys and play settings rather than being directed to specific materials. This too would support generalization of strategies across play contexts. Finally, the results of this study support the short term effects of this program on the children’s extended interactions with peers. Future work should examine the impact of intervention in the long term, to delineate the maintenance of peer play and the continued growth of social interaction skills across time.

In conclusion, this study provides a systematic extension of peer-mediated social skills intervention for preschoolers with ASD. Impairment in reciprocal social interaction is one of the core deficits seen in children with ASD, and facilitating the development of peer interaction skills in these children who are integrated into preschools and child care centres is a critical
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objective. The proposed peer-mediated social skills intervention for preschoolers with ASD is examined and is found to be effective in increasing the quantity and quality of extended interactions between preschoolers with ASD and their typically developing peers. Further, the intervention is shown to be acceptable within the context of a day care centre and its importance is confirmed by independent, lay observers.
References


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Peer-mediated intervention for preschoolers with ASD: Effects on responses and initiations

Abstract

This study investigates the effects of peer-mediated intervention on the responses and initiations of preschoolers (ages 4;2 – 5;1) with ASD. A speech-language pathologist and three early childhood educators trained typically developing peers to facilitate responses and initiations from three preschoolers with ASD during playtime. A single-subject multiple baseline design across subjects was used to determine the effects of the intervention. Play sessions between the children with ASD and their typically developing peers were videotaped and analyzed to collect information regarding responses and initiations. All three target children demonstrated improvements in their responses and initiations to their peers during intervention. Moreover, they maintained these gains four weeks later and generalized their response and initiation skills to an untrained peer. Social validity data, obtained using unbiased, independent, lay, observers to rate the children’s performance following intervention, provided external validation of an observable treatment effect. The results suggest that the collaboration between a speech-language pathologist and early childhood educators may be an effective model of service delivery to enhance peer interaction skills of preschoolers with ASD.

Keywords: autism spectrum disorder, peer-mediated intervention, social interaction
This study examines the effects of a peer-mediated intervention on the responses and initiations of three preschoolers diagnosed with Autism Spectrum Disorder (ASD). One of the defining features of ASD is difficulty with reciprocal social interactions (Diagnostic and Statistical Manual of Mental Disorders, 5th ed.; DSM-5; American Psychiatric Association, 2013), and children with ASD display difficulties with responding and initiating within social interactions across all ages and levels of cognitive ability (Tager-Flusberg, Joseph, & Fulstein, 2001). Relative to typically-developing peers, children with ASD spend less time in social interactions (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010), initiate engagement less often, and respond to fewer bids for joint attention from same age peers (Sigman & Ruskin, 1999; Wong & Kasari, 2012).

For preschoolers, relevant social interaction skills include initiating interactions and responding to peers’ initiations (Timler, Vogler-Elias, & McGill, 2007). Both initiating and responding skills are considered areas of deficit in children with ASD (Koegel, Vernon, Koegel, Koegel, & Paullin, 2012) and numerous peer-mediated intervention programs have specifically targeted these skills (e.g., Banda, Hart, & Lui-Gitz, 2010; Conroy, Boyd, Asmus, & Madera, 2007; Owen-DeSchryver, Carr, Cale, & Blakely-Smith, 2008). Also, children with ASD appear to have more difficulty with self-initiated joint attention, in which they draw the attention of a peer to a referent, relative to responsive joint attention, in which they respond by shifting attention to an identified referent (Houghton et al., 2013; MacDonald et al., 2006).

Peer-mediated interventions involve typically-developing peers who are systematically taught ways of engaging children with ASD in social interactions, thereby helping learners with ASD to acquire new social and communication skills (Fettig, 2013). The theoretical rationale for employing typically developing peers is the social-cognitive learning theory of skill acquisition
Peer-mediated intervention

(Bandura, 1989), which posits that social communication in typically-developing children emerges from, and develops within, social contexts. According to this view, all cognitive development is socially mediated and dependent on interaction with others and with the environment (Mallory & New, 1994).

Studies involving peer-mediated social skills intervention for younger preschoolers with ASD, typically report positive findings (Laushey & Heflin, 2000; Katz & Girolametto, 2013; Kohler, Greteman, Raschke, & Highnam, 2007; Hughett, Kohler, & Raschke, 2013). Taken together, the results indicate that, relative to baseline, the preschoolers with ASD improved their overall social interaction skills with peers as a result of such intervention. Katz and Girolametto (2013) also reported that, post-intervention, preschool children’s interactions were longer than at baseline, indicating more extensive involvement in play-focused interactions. However, in these previous studies, no distinction was made between responses and initiations, and thus, there is little information about the mechanisms involved in more extensive interactions. For example, improvements in social skills might yield a higher frequency of responses without concomitant increases in initiation skills. The current study uses the data presented in Katz & Girolametto (2013) to determine the effect of the intervention on both responses and initiations.

Several peer-mediated intervention studies focused specifically on improving the rate of responsiveness in preschoolers with ASD. For example, Kalyva & Avramides (2005) examined a peer-mediated intervention designed to improve the ability of children with ASD to respond to peers during play. The results indicated that the children with ASD increased their frequency of successful responses after intervention. Similar results were reported by McGrath, Bosch, Sullivan, & Fuqua (2008) who trained a preschool-age child with ASD to respond to the initiations of peers. These results are consistent with previous research suggesting that initiating
interaction may be a relative weakness compared to responding to bids for joint attention or joint action (Houghton, Schuchard, Lewis, & Thompson, 2013; Koegel, Carter, & Koegel, 2003; MacDonald et al., 2006).

Researchers have suggested that the lack of self-initiated interactions may limit social and verbal learning opportunities (Koegel, Koegel, Harrower, & Carter, 1999). To date, few peer-mediated intervention studies have reported information concerning facilitating initiations in children with ASD, and the impact of interventions on initiations is less consistent than that found for responses (e.g., Conroy, Boyd, Asmus & Madera, 2007; Nelson, McDonnell, Johnston, Crompton, & Nelson, 2007). Thus, Nelson and colleagues (2007) instructed four preschoolers with autism and their typically-developing peers to use the “Keys to Play” strategy, which entails the use of a specific strategy to enter a play situation. The results revealed that all four preschoolers increased the percentage of unprompted initiations to enter into play situations with their trained peers. In contrast, Conroy, Boyd, Asmus, & Madera (2007) measured the effects of an intervention targeting the initiation skills of a 4-year old child with ASD. They found that this child gained only minimally in terms of the number of his initiations, but did engage in longer sustained social interactions with his typically-developing peers. Taken together, these prior studies demonstrate that intervention targeting initiations may facilitate an increase in initiation skills, and an important question for future research concerns whether these results can be replicated and expanded.

Two pressing issues for research on interventions for children with ASD concern the measurement of generalization and social validity of the intervention effects. First, the existing research in the field of autism often fails to measure generalization of peer interaction skills to other interaction partners (Bass & Mulick, 2007; Matson, Matson, & Rivet, 2007; McConnell,
Timler, Vogler-Elias, & McGill (2007) suggest that, in order to be considered effective, interventions must show generalization of skills during “authentic interactions with peers” (p. 167). Second, most intervention studies of children with ASD do not consider measures of social/ecological validity. Matson et al. (2007) reviewed 79 interventions aimed at enhancing social skills with children with ASD and reported that only 10% of the studies considered social validity. Social validity is important because it provides an external judgment on the importance of intervention outcomes (Hurley, Wehby, & Feurer, 2010).

To address these gaps in the literature, the current study examined the effects of a peer-mediated intervention on the responses and initiations of three preschoolers diagnosed with ASD. The study uses the data presented in Katz & Girolametto (2013) to determine the specific discourse mechanisms (i.e., responses and initiations) that may have yielded the extended interactions reported in the previous study. A multiple baseline single-subject design measured children’s responses and initiations in two naturalistic play contexts. A speech-language pathologist (the first author) and three early childhood educators trained typically-developing peers to engage children with ASD in play within their child care classrooms. Generalization of the skills learned was measured by collecting data on subsequent responses and initiations with an untrained peer. Also, social validity of the intervention was measured using guidelines recommended by Foster and Mash (1999).

Methods

The broad methods of this study were detailed in Katz and Girolametto (2013), and are described concisely here. This study expands on this earlier work by examining data concerning the responses and initiations of three children with ASD to two trained typically-developing peers.
and the generalization of these discourse skills to untrained typically-developing peers. This study was granted approval from the Ethics Review Office of the University of Toronto.

Participants

Subjects were recruited by asking speech-language pathologists, psychological associates, and resource teachers in the Greater Toronto Area to describe the study to parents of suitable candidates and suggest their child’s participation. After obtaining parental consent, supervisors of the relevant childcare centres were asked to request consent from the early childhood educators who would potentially be involved. All the early childhood educators of the children who were considered for the study expressed interest and willingness to be involved in this study.

Children. The characteristics of the children with ASD are summarized in Table 1. The participants of this study included three preschool-age children with ASD between 4;1 to 5;1 years of age who had attended full time child care for at least 12 months. The diagnosis of ASD was made by an independent psychologist or developmental pediatrician using the The Autism Diagnostic Observation Schedule (ADOS; Lord, Risi, Lambrecht, Cook, Leventhal, DiLavore, Pickles, &Rutter, 2000). The children’s non-verbal cognitive abilities were within normal limits as measured by the Brief IQ screener of the Leiter International Performance Scale–R (Roid & Miller, 1997). The Socialization and Communication domains of the Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984) were completed by the early childhood educator for each child with ASD. The language and socialization scores for Lily and Joey were within one standard deviation of the mean. It should be noted that Jacob’s scores, while fitting the selection criteria of the study, were more than two standard deviations below the mean.
Table 1

*Characteristics of the Children with ASD*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Lily</th>
<th>Jacob</th>
<th>Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>4;8</td>
<td>4;2</td>
<td>5;1</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>ADOS* score</td>
<td>16 (module 2)*</td>
<td>15 (module 1)*</td>
<td>11(module 2)*</td>
</tr>
<tr>
<td>IQ (Leiter)†</td>
<td>109</td>
<td>98</td>
<td>111</td>
</tr>
<tr>
<td>Language SS (PLS-4)‡</td>
<td>87</td>
<td>59</td>
<td>95</td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>87</td>
<td>59</td>
<td>95</td>
</tr>
<tr>
<td>Expressive Communication</td>
<td>87</td>
<td>57</td>
<td>102</td>
</tr>
<tr>
<td>Socialization SS (VABS)§</td>
<td>98</td>
<td>69</td>
<td>110</td>
</tr>
</tbody>
</table>

*Lily was 4 years and 8 months old. She engaged in parallel play with her peers when guided by an adult. Lily communicated mainly with adults rather than with her peers. She communicated using two- and three-word utterances primarily for requesting but rarely initiated and responded for social interaction purposes.*
Jacob was 4 years and 1 month old. He engaged in solitary play alongside other children but rarely shared play materials and did not take turns while playing. Jacob did not initiate interactions and seldom responded to peer initiations. Jacob used one- and two-word utterances mainly to make requests.

Joey was 5 years and 1 month old. He engaged in solitary play and during free-play time outside he repeatedly ran laps around the playground. He did not usually initiate interactions or respond to his peers’ attempts to engage him. Joey did not readily share toys and did not often engage in social interactions. He communicated using short sentences mainly to request or protest.

Three typically-developing peers were nominated by the early childhood educators to serve as peer interventionists for each child with ASD. These children were in the same classroom as the child with ASD and had (a) typical language development, (b) typical social skills as determined by the Social Interaction Assessment Scale completed by their educators (adapted from McConnell & Odom, 1999), and (c) previously expressed interest in interacting with the child with ASD, as reported by the early childhood educator. Two peers were randomly chosen to be trained as peer interventionists. The third peer was not trained and was involved in the study only for the purpose of collecting data regarding the generalization of skills across peers. Peer characteristics are presented in Table 2.

_Early Childhood Educators._ Three female early childhood educators with at least five years of experience in child care and six months experience with a child who had special needs participated in this study. The educators worked in different child care centres and had a preschool-aged child with ASD integrated into their classrooms. All had completed a 2-year
Table 2

*Characteristics of typically developing peers*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Peers for Lily</th>
<th>Peers for Jacob</th>
<th>Peers for Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1  P2  P3</td>
<td>P1  P2  P3</td>
<td>P1  P2  P3</td>
</tr>
<tr>
<td>Age</td>
<td>4;0  4;7  5;3</td>
<td>4;11 5;4  3;8</td>
<td>5;6  4;9  4;9</td>
</tr>
<tr>
<td>Gender</td>
<td>F    F    F</td>
<td>F    M    F</td>
<td>M    F    M</td>
</tr>
<tr>
<td>Language SS (PLS-4)*</td>
<td>106  104  109</td>
<td>109  113  102</td>
<td>107  125  101</td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>107  95  102</td>
<td>106  108  121</td>
<td>101  119  119</td>
</tr>
</tbody>
</table>

*Standard scores on The Preschool Language Scales–4 (Zimmerman, Steiner, & Pond, 2002). P = peer; P3 was untrained.

A college diploma in early childhood education from a Canadian institution and held the primary position of responsibility for curriculum planning for the child with ASD.

*Settings and Materials*

The study took place in three licensed child care centres that integrated children with ASD into regular classrooms. The materials used in this study were an intervention manual (unpublished, available from the first author on request), a storybook (*Franklin’s New Friend*, Bourgeois, 1997), puppets of the two main characters in the storybook, and two picture communication boards depicting strategies to promote responses and initiations. The book “Franklin’s New Friend” (Bourgeois, 1997), was chosen because the story addresses the themes of friendship, peer interactions and peer support that are intrinsic to the social skills training. The
two picture communication boards were developed using Boardmaker - Picture Communication Symbols computer program (Mayer-Johnson Co., 1995). Boards were printed on 8 X 11 inch poster boards. Board 1 included coloured pictures of five strategies that children could use in order to initiate interactions with their peers (“I want to play”; “Please help”; “Come play”; “Give a toy”; and “Tap the shoulder”) . Board 2 included pictures of five strategies that could extend and maintain social interactions (“Let’s play more”; “Good job!”; “My turn/your turn”; “Do it again”; and “I like that!”). The materials also included blocks with toys (i.e., people figures, vehicles) and play dough with utensils (i.e., mixers, spatulas, cookie cutters, pizza cutter).

**Experimental Design**

A single-subject multiple baseline design across three participants was used to evaluate the effects of intervention on the children’s responses and initiations in naturalistic play sessions. The design incorporated non-concurrent multiple baselines (Watson & Workman, 1981), which allows for flexibility in applied research settings while maintaining the design parameters necessary for ensuring the relationship between treatment variables and behavior changes (e.g., Koegel, Vernon, Koegel, Koegel, & Paullin, 2012). In this design the researcher pre-determines the increasing length of each of the baseline phases. As subjects are recruited, they are randomly assigned to one of the pre-determined baseline lengths.

**Procedures**

**Baseline.** Each of the three participants with ASD was randomly assigned to a baseline length of 2, 3, or 4 weeks. However, due to scheduling problems at the childcare centres (e.g., vacations, special programming, absences) their baselines were, in effect, 2, 4, and 5 weeks long. Baseline data were collected for each child’s interactions with each of the three peers in two naturalistic play contexts (i.e., play dough, block play). For each child with ASD, the first peer in
the play session was chosen randomly. Thereafter, the order was counterbalanced. During baseline, the children played without direction or prompts from adults; each peer was told that he/she had been chosen to be a “special friend” for the play session and that he/she was to try to engage their friend (the child with ASD) in play. Sessions lasted 20 minutes: 10 minutes with blocks and 10 minutes with play dough. All sessions were videotaped using a hand-held Panasonic Digital Camcorder with a built-in microphone (model # PV-DV601-K).

**Intervention Program.** The intervention program, which is described in detail in Katz and Girolametto (2013), consisted of four consecutive components: (a) two training sessions for educators; (b) five half-hour social skills training sessions for children which took place immediately after baseline measures were completed; (c) twelve 20-minute play sessions during which the educators supervised the children’s participation; and (d) four follow-up and support sessions for the educators.

The educators’ training took place during two 30-minute sessions in the staff room at the child care centre. The first author gave educators an intervention manual and specific instructions for the intervention. Also, educators were given the storybook and two Social Skills Communication Boards. The storybook introduced the children to the concept of playing together and suggested ways of interacting with peers to develop a friendship.

The second component of the intervention comprised of half-hour social skills training sessions for the children with ASD and two peers which were administered on five consecutive days. These sessions took place in the preschool room at the childcare centre and were scheduled

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1 Each peers’ name was written on a piece of paper which was folded so the name could not be seen. The early childhood educator chose one paper, and thereby selected the first peer.
for times that the other preschool children were in the playground or in a different room with another adult. The first author and the educator co-lead these sessions. The first two social skills training sessions involved reading the storybook, Franklin’s New Friend (Bourgeois, 1997), and giving each child an opportunity to re-enact the story using puppets. During the remaining sessions the children were introduced to strategies to initiate and respond using the two communication boards.

The third component of the program consisted of twelve 20-minute implementation play sessions that were supervised by the early childhood educator, of which 10 minutes were with blocks and 10 minutes were with play dough (the order was counterbalanced). These play sessions took place three times a week for four weeks and were videotaped by the first author. Each child with ASD participated in a total of six implementation play sessions with each of the trained peers. For the play sessions, the educator invited the child with ASD and one trained peer to play together and remained present to facilitate the 20-minute play interaction. Communication boards were placed in the play area and, as per the intervention protocol, whenever there was a period of approximately 30 seconds with no joint interaction, the educator prompted the children to use a specific strategy on the communication board (e.g., “Joey, do you want a block? What can you say?”).

The fourth component of the program included follow-up and support sessions for the early childhood educators which took place following completion of the implementation play sessions. The early childhood educator continued pairing the child with ASD with a trained peer for specific play times three times a week in the classroom. The first author provided four telephone meetings with the early childhood educators to answer questions and to encourage the
continued pairing of the child with ASD with a trained peer. Educators were instructed to refrain from providing prompts during these sessions.

*Maintenance and Generalization.* Approximately four weeks after the implementation play sessions were completed, two 20-minute play sessions were videotaped to collect data regarding the maintenance of response and initiation skills. In addition, a 20-minute play session was videotaped with the untrained peer to collect data regarding the generalization of response and initiation skills. Maintenance and generalization sessions were identical in format to the baseline sessions, that is, the children were asked to play together without any direction or prompting from adults.

**Dependent Variables**

In order to derive the first two dependent variables used in this study an interval coding system (Bordens & Abbott, 1999) was applied to all play sessions. Interval coding was chosen over momentary time sampling since it allows continuous observation of the children’s behaviour through whole intervals, and captures data that are generally representative of the children's interactions (Billingsley, Deitz, Tanta, & White, 2005). In order to facilitate interval coding, each videotaped session was divided into 100 six-second intervals, using a visual signal to indicate the beginning and end of each segment. The first author or a trained research assistant reviewed the videotapes and entered a code (i.e., response, initiation, or non-interactive) every six seconds for a total of 200 intervals per 20 minute session (play dough and blocks combined). Detailed definitions for the dependent variables can be found in the Child Intervention Code (Appendix).²

² The Appendix of this chapter is the Child Intervention Code which corresponds to Appendix D of the dissertation.
**Responses.** The first dependent variable was the proportion of responses expressed as a percentage of all coded intervals. Responses were defined as eye-gaze, gesture, or verbalization that were directed towards the peer or a referent named by the peer that occurred within two observational intervals (i.e., within 12 seconds) of the initiating event. Responses were coded if they occurred within two coding intervals. Negative responses, which included all verbal or physical actions that are uncomplimentary, rejecting, or physically harmful in nature, were also recorded. However, fewer than 0.7% of responses were negative and these were not included in the total number of responses.

**Initiations.** The second dependent variable was the proportion of initiations expressed as a percentage of the intervals remaining after responses were eliminated (Nelson, McDonnell, Johnston, Crompton, & Nelson, 2007). This was done because as children’s responses increase, the opportunities available for initiations decrease (Conroy, Boyd, Asmus, & Madera, 2007). An initiation was defined as a behavior that began an interaction and was not elicited or prompted by the peer’s behavior during the two immediately preceding coding intervals. Initiations included invitations to play (e.g., the child with ASD specified an activity, suggested a play idea, or directed the peer to engage in an activity-related play behavior), offers of objects, and requests for an object or help. Fewer than 1% of the initiations were negative and these were not included in the total number of initiations.

**Social validity.** Social validity of the intervention was obtained from unbiased, independent, observers (Hayes & Haas, 1988). Five undergraduate students in a language development class at a community college were asked to view two 2-minute video recordings: of which one was selected randomly from the baseline, and one was selected randomly from the maintenance sessions of each target child. The recordings were randomly ordered. The students,
who were blind to the experimental condition and purpose of the study, were asked to respond to questions about the observed frequency of the target children’s responses and initiations.

Treatment fidelity

As described in Katz and Girolametto (2013), fidelity was measured for the five social skills training sessions to determine whether the intervention was administered consistently and in accordance with the manual. The results revealed 100% compliance in all five social skills training sessions, indicating that the training sessions were delivered consistently to all children. Furthermore, the educators’ adherence to the protocol regarding prompts and praise was evaluated by examining the recordings of all videotaped sessions. Results revealed that educators provided prompts and praise as instructed.

Interrater Agreement

To ensure the reliability of the interval coding system, 20% of all videotaped play sessions were selected using a computer-generated random number table. Sessions were selected randomly for each participant and coded independently by the first author and a trained assistant. Interrater reliability was calculated using point-by-point agreement. This is considered an accurate estimate of reliability when responses are scored using time interval coding procedures (Hegde, 1994; Kazdin, 1982). The percentage agreement was 91% for responses (n = 1322), 85% for initiations (n = 306), and 95% for non-interactive (n=2295). The average inter-rater reliability for responses, initiations and non-interactive combined was 92.8% (n = 3923). The percentage agreement for prompts and praise was 100% (n= 156).
Results

For the analysis presented here the child’s responses and initiations were measured by averaging across the play contexts of play dough and block play (10 minutes each). The effectiveness of the intervention was examined by comparing the children’s performance in the different phases of data collection, that is during baseline, during the last three implementation sessions and during the maintenance sessions. The data for the first three implementation sessions were not included in the analysis. Up to and including the third session, less than 50% of the implementation had been administered and it was felt that using these data would not meaningfully capture the effect of the intervention. The effectiveness of the intervention was also examined by calculating the percentage of nonoverlapping data points (PND), as described by Scruggs and Mastropieri (1998). PND scores are determined by calculating the percent of intervention data points that do not overlap with the highest baseline data point. Scruggs and Mastropieri suggest that PND scores above 90 represent “very effective” intervention scores, scores from 70 - 90 represent “effective” interventions, scores from 50 - 70 are “questionable”, and scores below 50 are “ineffective”.

Effects of Intervention on Responses

The data points and line graphs in Figure 1 represent the extent to which the child with ASD responded to his/ her peer interventionist during the baseline sessions, the implementation play sessions, and the maintenance sessions.
Lily. Examination of the data for Lily in Figure 1 indicates that her four baseline measurements with peers were stable, with responses averaging from 11.5% for Peer 1 and 8% for Peer 2. Following the social skills training sessions, Lily participated in six play sessions with Peer 1, and in five play sessions with Peer 2. Lily’s Peer 2 was absent for the sixth play session, and an average was calculated for the fourth and fifth play sessions only. With Peer 1, Lily increased her initiations to an average of 44% during the last three play sessions. Lily increased her responses to Peer 2 to an average of 29% during the last two play sessions. Four maintenance sessions were videotaped, two with each of Lily’s trained peers. The first
Peer-mediated intervention

maintenance session took place 5 weeks after the last play session. The second session took place four weeks later. At maintenance, Lily’s responses to Peer 1 were 83% and 71%, which represents an average increase of 66% from baseline. With Peer 2, Lily’s responses increased from 22% at the first maintenance session to 48% at the second maintenance session, representing an average increase of 27% from baseline. The percentage of nonoverlapping data (PND) revealed that none of Lily’s play or maintenance data points overlapped with any of her baseline data points. Lily thus achieved PND scores of 100% for both play and maintenance. Generalization data for Lily in Figure 1 indicates that during baseline, Lily responded to her untrained peer during 11% of the session. During the generalization phase, Lily substantially increased her responses to an untrained peer to 86.5%.

*Jacob.* Four baseline measures were taken for Jacob over a three-week period prior to intervention (twice with each trained peer). Examination of the data in Figure 1 reveals that Jacob’s measurements were stable, with responses to Peer 1 averaging 16% and responses to Peer 2 averaging 13%. Following the social skills training sessions, Jacob participated in six play sessions with both peers. During the last three play sessions with Peer 1, Jacob increased his responses to an average of 70%, which represented an increase of 54% over baseline measurements. With Peer 2 Jacob increased responses to an average of 43%, which was an increase of 30% from baseline measurements. Peer 2 was not available for the maintenance sessions because he left the child care centre. Hence, maintenance was measured only with Peer 1. At maintenance, Jacob’s responses were 54% and 62%, representing an average increase of 42% from baseline. The percentage of nonoverlapping data (PND) was 100% for both play and maintenance. For Peer 2, one out of six play data points overlapped, giving Jacob a PND score of 83%. Generalization data indicate that, during baseline, Jacob responded to his untrained peer
22% of the baseline session and he increased his responses to 63.5% during the generalization sessions.

Joey. The six baseline measurements for Joey took place over a period of five weeks. The data depicted in Figure 1 demonstrate that measurements were stable, with responses to Peer 1 averaging 3% and responses to Peer 2 averaging 17%. Following the social skills training, Joey participated in six play sessions with both peers. During the last three play sessions, Joey’s responses increased to an average of 55%, which represents an increase of 52% over baseline, with Peer 1. With Peer 2, Joey’s responses increased to 59%, which represents an increase of 42% over baseline measures. Maintenance sessions for Joey were videotaped four times, twice with each peer. Joey’s responses to Peer 1 during maintenance were 58% and 71%, which is an average increase of 62% over baseline. Joey’s responses to Peer 2 during maintenance were 36% and 42%, which is an average increase of 22% over baseline. The percentage of nonoverlapping data (PND) revealed no overlap of any of Joey’s play or maintenance data points with his baseline data points. Joey thus achieved PND scores of 100% for both play and maintenance. Generalization data for Joey in Figure 1 indicates that during baseline, Joey responded to his untrained peer during 14% of the session. During the generalization phase, Joey increased his responses to 54.5%.

Effects of Intervention on Initiations

The data points and line graphs in Figure 2 represent the extent to which the child with ASD initiated to his/ her peer interventionist during the baseline sessions, the six play sessions, and the maintenance sessions.
**Lily.** Examination of the data depicted in Figure 2 indicates that Lily’s baseline measures were stable and consistent, averaging 1.5% for Peer 1, and 2% for Peer 2. During the last three play sessions, Lily initiated interactions to Peer 1 in an average of 20% of the available six-second intervals. With Peer 2, Lily initiated an average of 12.4%. Four maintenance sessions were videotaped, two with each of Lily’s peers. At maintenance, Lily’s initiations with Peer 1 averaged at 15%, which represents an increase of 13.5% from baseline. Lily’s initiations with Peer 2 averaged 22% during the maintenance sessions, which indicates an increase of 20% from baseline. None of the play or maintenance data points overlapped with any of the baseline data points. Thus, Lily achieved PND scores of 100% for both play and maintenance sessions. Generalization data for Lily in Figure 2 indicates that during baseline, Lily initiated to her
untrained peer during 2% of the available intervals in the session. During the generalization phase, Lily increased her initiations by more than 30% to 33%.

*Jacob.* The data depicted in Figure 2 demonstrate that Jacob’s baseline initiations averaged 6% for Peer 1 and 4.5% for Peer 2. During the last three play sessions, Jacob’s initiations averaged 23.5% with Peer 1 and 31% with Peer 2. At maintenance, Jacob’s average rate of initiation for Peer 1 was 9.5%, which is a small increase of 3.5% from baseline. Jacob’s Peer 2 was not available to participate in maintenance sessions. For Peer 1, two of the eight play and maintenance data points overlapped, giving Jacob a PND score of 75%. For Peer 2, none of the play data points overlapped with the baseline data points, yielding PND scores of 100% for the play sessions with Peer 2. Generalization data for Jacob in Figure 2 indicates that during baseline, Jacob initiated to his untrained peer during 3.2% of the available intervals in the session. During the generalization phase, Jacob increased his initiations to 34.2%.

*Joey.* The data depicted in Figure 2 demonstrate that Joey’s initiations remained stable during the baseline period and averaged 2.6% for Peer1 and 7.6 for Peer 2. During the last three play sessions, initiations took place an average of 22.6% of the time with Peer 1 and 24.6% with Peer 2. At maintenance, Joey’s initiations to Peer 1 and Peer 2 increased from baseline to an average of 23.8% and 16% respectively. For Peer 1 and Peer 2, none of the data points during the play sessions and maintenance overlapped with any baseline data points, giving Joey a PND score of 100% with both peers. Generalization data for Joey indicates that during baseline, Joey initiated to his untrained peer during 2.3% of the available intervals in the session. During the generalization phase, Joey increased his initiations to 7.7%.
Social Validity of the Intervention

In order to measure the social validity of the intervention, five undergraduate students in a language development class at a community college were asked to view two 2-minute video recordings randomly selected taken from the baseline and maintenance sessions of each target child and to respond to two questions using a 5-point Likert scale (1=very low/not at all; 3= normal for age; 5= very high/very often). The questions were (a) “Does this child respond to play invitations?”, and (b) “Does this child initiate cooperative play?”. The observers rated all three target children with a score of 1 - 1.2 for responses and initiations for video recordings filmed during the baseline phase. Improvements were noted during the recordings filmed during the maintenance sessions. Responsiveness ratings were 3.2, 3.8, and 4.2 for Lily, Jacob, and Joey respectively. Initiation ratings were 2.0, 3.8, and 4.0 for Lily, Jacob, and Joey respectively. The observers, therefore, rated the children’s performance higher following intervention, providing external validation of an observable treatment effect.

Discussion

This study explored the use of a peer-mediated intervention to facilitate increases in responses and initiations of preschoolers with ASD to typically-developing peers in their classrooms. Whereas the study reported by Katz and Girolametto (2013) looked at overall engagement and length of interactions of preschoolers with ASD, the current study considered specific discourse skills, namely, initiations and responses. Indeed, according to Hadley and Rice (1991), participation in an interactive exchange requires basic primary skills that include the ability to initiate an interaction and the ability to appropriately respond and thereby maintain an interaction (p. 1308).
Several significant findings emerge from this study. First, following the intervention, the responses of children with ASD increased significantly. Specifically, all three children with ASD substantially improved the frequency of their responses to two trained peers during play sessions, and maintained these gains in responses at the maintenance test time, which occurred four to seven weeks after the intervention. This finding lends support to previous studies that have shown increases in responses following participation in peer-mediated interventions (e.g., Kalyva & Avramides, 2005; McGrath, Bosch, Sullivan, & Fuqua, 2008).

Second, following the intervention, all three children with ASD substantially increased the frequency of their initiations to their two trained typically-developing peers during play sessions. Moreover, they also maintained these gains in initiations. Initiating interactions is considered a crucial social skill (Beilinson & Olswang, 2003), and children with autism often have particular difficulty imparting a desire to enter play activities (Nelson, McDonnell, Johnston, Crompton, & Nelson, 2007). As posited by Weiss and Harris (2001), making initiations toward peers is critical because it “ensures that children with autism have skills in orchestrating interactions, and not simply in responding to the overtures of others” (p. 291). It is of interest to note that the data reveal that the rates of initiation achieved as a result of this intervention appear to be of the same order of magnitude as the rates of initiation of typically-developing children (e.g., Davis, Brady, Hamilton, McEvoy, & Williams, 1994; Gena & Kymissis, 2001). Given that difficulties with initiating interactions with others is considered a critical marker of one of the core deficits in ASD (DSM-5), the finding that children with ASD were able to increase their initiations to initiation levels of typically-developing children is particularly notable. Indeed, the results regarding the increase in initiations of the children with ASD add substantially to our appreciation of evidence-based interventions in this area.
Third, following the intervention, the children with ASD generalized their increases in the frequency of both responses and initiations to untrained peers in their classrooms. Generalization of skills acquired is considered an important feature of an effective intervention (Timler, Vogler-Elias, & McGill, 2007). Indeed, it is the ultimate goal of this type of intervention to ensure that the target children are able to use their newly acquired skills to interact within their natural social contexts (Rogers, 2000) and not only with a restricted set of trained peers. However, many previous studies do not report measures of generalization to untrained peers (e.g., Banda, Hart, & Lui-Gitz, 2010; Hughett, Kohler, & Raschke, 2013; Kohler, Greteman, Raschke, & Highnam, 2007). The fact that the target children were able to generalize their responses and initiations to untrained peers suggests that peer-mediated intervention may be useful in enhancing such interaction skills with a wide range of play partners.

Finally, this study measured the social validity of the intervention and the findings. Independent, lay observers rated randomly-presented videotapes of the children’s interactions and consistently rated the post-intervention videotapes as displaying increased responses and initiations. Measuring the social validity of an intervention is crucial because it represents an external common-sense measure of the efficacy of the treatment (Foster & Mash, 1999). Social validity measures inform parents and practitioners about the transparency with which others can perceive changes in children. The subjective measure of social validity confirmed the clinical importance of the findings of this study.

A number of limitations and recommendations for future research may be of interest. First, it would be useful to repeat this intervention with more children with ASD. Although replication of outcomes across three children is considered to be a benchmark of successful intervention in single subject designs (McReynolds & Kearns, 1983; Tawney & Gast, 1984), the
characteristics of the target children in this study may restrict its generality. A further limitation of the current research is that it was conducted in the children’s classrooms without other children present. This study might be extended by investigating the effect of the intervention when presented in a typical classroom situation that includes other preschoolers. It would also be of interest to assess generalization with more than one typically-developing peer. Further research might consider children of different age-groups and/or with different developmental patterns. In addition, this intervention would benefit from considering the effect of using a higher number of typically-developing children as peer-interventionists. Because there are usually many peers in each integrated classroom, it would be important for future studies to engage the entire peer group to provide consistent environments for the child with ASD and other children with disabilities in the same classroom. Finally, the long-term effect of the intervention on the children’s responses and initiations is of great interest and could constitute a useful extension of this research.

In conclusion, the first main implication of the current study is that children with ASD were found to have increased and maintained their response and initiation skills following a brief intervention. The children’s gains in responses and, in particular, initiations address one of the core deficits in ASD, namely social interaction impairments (DSM-5). These findings are significant because children with ASD who engage in interactions more frequently, in turn elicit more linguistic and social feedback from their peers from which they can learn (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010).

The second main implication is that a consultation and collaboration between a speech-language pathologist and the children’s early childhood educators may be an essential component of the service delivery model of the peer-mediated intervention. The two professionals co-taught
the social skills program (i.e., five sessions) and delivered the intervention together during the intervention phase. The reported findings in the current study regarding both responses and initiations are therefore encouraging and supportive of the usefulness of the intervention model and provide a notable addition to the body of evidence-based interventions in this area.
References


CHAPTER 5

Discussion

The purpose of the studies presented in this dissertation was to describe the effects of a peer-mediated social communication intervention on pre-schoolers with ASD. Three preschool-age children with a diagnosis of ASD, their primary early childhood educators, and nine typically-developing intervention peers were recruited to participate in this project. This discussion briefly reviews the findings of the two studies and subsequently describes the joint contribution of these studies to the literature. The limitations of these studies and some important, future directions for research on peer-mediated intervention are discussed.

Study 1

The first study presented in this thesis (i.e., Chapter 3), reported on the effects of the intervention on the number and length of interactions of the children with ASD. This study yielded several major findings. First, the intervention improved the social engagement of the children with ASD. Specifically, all three children with ASD markedly improved the number and length of their extended interactions during play sessions with their trained peers. In addition, the children with ASD maintained these gains 4 to 5 weeks after the intervention was completed, during the maintenance testing period.

The observed increases in extended interactions confirm the findings of prior intervention studies that use peer interventionists to promote children’s social interaction skills (Banda, Hart, & Lui-Gitz, 2010; Keen, Sigafoos, & Woodyatt, 2001; Kohler, Greteman, Raschke, & Highnam, 2007). However, only a few of these earlier studies focused on the length of extended interactions (Conroy, Boyd, Asmus, & Madera, 2007; Nelson, McDonnell, Johnston, Crompton,
Peer-mediated intervention

& Nelson, 2007). The finding in the current study that the children with ASD increased the length of their extended interactions is notable because it increased the children’s ability to maintain topics across multiple turns (Licciardello, Harchik, & Luiselli, 2008). Furthermore, the maintenance of children’s newly learned behaviour has not been extensively documented in previous studies (see Banda et al., 2010; Keen et al., 2001). In contrast, the current data find that the three children with ASD maintained their gains in social interactions 4 to 5 weeks following training. A transcript of interactions between children with ASD and their peers can be found in Appendix G. An examination of this transcript provides examples of the extended interactions that took place during the post-intervention sessions.

Second, this study examined the social validity of the intervention (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi & Gower, 2005). Two independent measures of social validity of the peer intervention were included (i.e., educators’ self-evaluation and observer judgement). It was predicted that the educators would find the program feasible as determined by their ratings on a scale that measured the suitability of the program for their centres. This prediction was based on the positive outcomes of previous interventions that have been conducted successfully in preschool classrooms (Goldstein et al., 1992; Laushey & Heflin, 2000; McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992; McGrath, Bosch, Sullivan, & Fuqua, 2003; Sainato, Goldstein, & Strain, 1992). The findings indicated that the educators believed the intervention was feasible to use in their classrooms. Furthermore, naïve observers consistently rated all three children with ASD as displaying increased interactions with peers, increased turn-taking, and increased engagement in extended interactions at maintenance.

Finally, the third finding of this study addressed issues of treatment fidelity. Research has reported positive outcomes for peer-mediated interventions for children with ASD but persistent
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problems with lack of treatment fidelity have been identified (Chan et al., 2009). In this study, treatment fidelity was measured for the five social skills training sessions to ensure that the intervention was administered consistently, and in accordance with the manual, to all three groups of children. The results revealed 100% compliance in all five social skills training sessions, indicating that the training sessions were delivered consistently to all children. Measurement of fidelity in intervention studies is important for several reasons. Fidelity measures provide information for replication studies and add to the description of children’s experiences in the study (Wolery, 2011). Also, measuring fidelity allows investigators to document the fact that findings were due to an intervention that was delivered consistently to all participants.

This study adds to the growing body of evidence supporting peer-mediated interventions (Bass & Mulick, 2007; Chan et al., 2009; Goldstein, Schneider, & Thiemann, 2007) and corroborates the finding that these interventions are effective in improving the interactions of children with ASD. The primary result reported in this study (i.e., the increase in the length of extended interactions after intervention), is particularly noteworthy, because the increasing length of interactions may be viewed as indicative of the quality of interactions (Licciardello, Harchik, & Luiselli, 2008). Longer peer interactions may be viewed as more meaningful interactions and may expose children to a wide range of discourse types with opportunities for collaborative language learning (Blum-Kulka, Huck-Taglicht, & Avni, 2004). From the results reported in this study it appears that training typically-developing peers to engage children with ASD in their social play reinforces the social interactions of the children with ASD. Moreover, the children maintained their gains over time and naïve observers were able to identify these gains at maintenance testing. These results are clinically important because children with ASD
who engage more often in interactions elicit more social feedback and more language involvement from their peers (Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010). In other words, the intervention may create a positive cycle of enhanced opportunities for language learning and communication, promoting more ongoing social interactions for the children with ASD.

Study 2

The data reported in Chapter 4 explored the effectiveness of the intervention in facilitating increases in responses and initiations of preschoolers with ASD to typically-developing peers in their classrooms. Whereas the previous study looked at overall engagement and the length of interactions, the current study addressed the specific discourse features used in the interactions, that is, responses and initiations (Paul, 2007, p. 490). This study yielded several important results. First, following the intervention, the responses of children with ASD increased significantly. Specifically, all three children with ASD substantially improved the frequency of their responses to two trained peers during play sessions, and maintained these gains in responses at the maintenance test time. The gain in responses is not surprising, and serves to replicate and reinforce data reported in previous peer-mediated interventions (Bass & Mulick, 2007; Chan et al., 2009; Goldstein, Schneider, & Thiemann, 2007).

Second, following the intervention, all three children with ASD substantially increased the frequency of their initiations to their two trained typically-developing peers during play sessions and maintained these gains in initiations at the maintenance test time. Only a few studies that explored the effects of peer-mediated intervention on interactions have reported increases in the initiations of the children with ASD (e.g., Banda et al., 2010; Conroy et al., 2007; Nelson, et
Initiating is considered a vital social skill because before children can engage in a peer interaction they have to find a way to begin engagement (Beilinson & Olswang, 2003). As posited by Weiss and Harris (2001), initiating toward peers is critical in order to ensure “that children with autism have skills in orchestrating interactions, and not simply in responding to the overtures of others” (p. 291).

It is of interest to note that examination of the data reveals that the rates of initiation in a ten-minute period achieved as a result of this intervention appear to be of the same order of magnitude as the rates of initiation of typically-developing children. Davis, Brady, Hamilton, McEvoy, & Williams (1994) collected “normative data” (p 623) on the rates of social initiation between 24 typically-developing boys and girls. Children were observed in their play groups (three groups of eight children, aged 4 – 8 years) during a 10 minute free play session for three days. The researchers reported an average initiation rate of 0.8 initiations per minute for typically-developing children (i.e., eight initiations in 10 minutes). Gena & Kymissis (2001) examined the rate of social initiations of typically-developing kindergarten children and reported that they initiated between 22 and 44 times during a 30 minute period, which roughly corresponds to between 7 and 15 times in ten minutes. These rates of initiation are comparable to the raw data presented in Chapter 4 of this study where children evidenced initiations that averaged between 7% and 17% of the time during their last three play sessions. Given that difficulties with initiating interactions with others is considered a critical marker of one of the core deficits in ASD (Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM 5; American Psychiatric Association, 2013), the finding that children with ASD were able to increase their initiations to the initiation levels of typically-developing children is particularly
notable. Indeed, the results regarding the increase in initiations of the children with ASD add substantially to our appreciation of evidence-based interventions in this area.

Third, an important conclusion emerging from the data reported in Chapter 4 is that, after the intervention the children with ASD generalized their increases in the frequency of both responses and initiations to untrained peers in their classrooms. Generalization of skills acquired is considered an essential feature of an intervention and in order to be considered effective, interventions must demonstrate generalization of skills during “authentic interactions with peers” (Timler, Vogler-Elias, & McGill, 2007, p 167). It is the ultimate goal of this type of intervention to ensure that target children are able to use their newly acquired skills to interact within their natural social contexts (Rogers, 2000) and not only with a restricted set of trained peers. However, many studies have not included measurement of generalization to untrained peers (e.g., Banda et al., 2010; Hughett, Kohler, & Raschke, 2013; Kohler, Greteman, Raschke, & Highnam, 2007). Consequently, the fact that the target children were able to increase their responses and initiations to trained peers, and were also able to generalize their responses and initiations to untrained peers indicates more completely the efficacy of the intervention. The reported findings in the current study regarding both responses and initiations are therefore encouraging and supportive of the usefulness of the intervention, and provide an important addition to the current understanding of peer-mediated interventions.

Joint Contributions of Studies 1 and 2

The first contribution of these studies is insight into the overall effects of peer-mediated intervention on the macrostructure and microstructure of children’s social interactions. The first level of analysis, macrostructure, included the number of extended interactions and length of these interactions, while the second level of analysis, focusing on microstructure, included the
frequency of specific discourse skills used in these interactions (i.e., responses and initiations). Taken together, the impact of the peer-mediated intervention was observed in both levels of measurement, indicating effects on both large units of interaction (e.g., the length of interactions) and on more discrete turns within the interaction (e.g., initiations). These levels of analysis suggest that both quantitative and qualitative outcomes were observed following intervention.

Previous social interaction studies have measured the quantity of specific interaction behaviors resulting from intervention, including the amount of eye gaze (Carbone et al., 2013), the number of joint attention episodes (Kasari et al., 2006), or number of utterances (Craig-Unkefer & Kaiser, 2003). These studies contribute to our knowledge about the effects of intervention to increase specific skills. Although these behaviors are important outcome measures and integral components of social interactions, they do not consider the impact of intervention on the children’s interactions as a whole (Griswold & Townsend, 2012). Moreover, there have been calls in the literature to look at social behaviour as an aggregate of social initiations and social responses rather than initiations and responses separately (e.g. Tsao & Odom, 2006; Goldstein, H., Kaczmarek, L., Pennington, R., & Shafer, K., 1992). The two studies in the current dissertation undertook to examine the quantity of discrete skills (as reflected in the coding system) as well as the impact of an improvement in these specific skills on the overall interactions with peer interventionists. As such, these two studies examine both the microstructure (i.e., quantity of initiations and responses) and the macrostructure (i.e., quality of interactions) between children with ASD and their peers.

Quality has been measured in different ways in studies of social interaction. For example, Licciardello, Harchik, & Luiselli (2008) suggest that data that represents the duration of interactions should be included in an analysis of “quality of peer interactions” (p. 34). In a study
Peer-mediated intervention designed to assess the quality of communicative interaction in a group of profoundly deaf children, Rodriguez and Lana (1996) defined quality in terms of extended interactions (i.e., interactions of more than two turns). These two previous studies considered that a change in the quality of interactions occurred because the children with ASD or hearing loss learned to sustain joint attention and engage in social interactions for longer periods of time. These longer interactions provide children with ASD or hearing loss more practice to use their skills to maintain social engagement and more opportunities to learn social communication from their peers’ turns. Given that joint attention and social interaction are core deficits of autism, these outcomes are noteworthy. In the current dissertation, Study 1 examined the quality of intervention outcomes using the number of extended interactions and their average length. Each coding period was six seconds in length, thus the average length of extended interactions for each child with ASD revealed that the duration of joint attention and engagement (in terms of units of time) also increased as a result of the intervention. From this perspective, the fact that the children with ASD and their peers increased both the number and the length of their extended interactions may be taken to indicate that the quality of children’s interactions has increased.

It is important to emphasize that measuring outcomes in terms of macrostructure (i.e., a measure of quality) and microstructure (i.e., quantity of initiations and responses) is likely to yield a better understanding of the impact of the intervention on children’s’ social interactions. In the context of the current dissertation, for example, an examination of Lily’s initiations to Peer 1 reveals fewer initiations in the second maintenance session than in the first (p. 142). At first glance it appears that Lily may not have maintained her skills in initiating to her peer. However, an examination of these quantitative data in conjunction with the qualitative data regarding the number and length of her interactions (pp. 106-107) reveals that the low rate of initiations
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occurred in the context of 15 lengthy extended interactions. In this case, it is likely that these lengthy, extended interactions displaced the need for Lily to initiate. Similarly, an examination of the maintenance data for Jacob’s initiations with Peer 1 (p.143) indicates that Jacob demonstrated only a small increase of 3.5% in initiations over baseline measures. The data regarding the number and length of his interactions (pp. 106-107) suggests, however, that Jacob showed significant gains in both number of extended interactions and the length of these interactions. This indicates a significant improvement in his overall social interaction despite the relatively small gain in initiations. Finally, looking at initiations and responses together may also explain the generalization data for Joey with his untrained peer. Examination of the data (p.143) indicates only a limited gain in Joey’s initiations to his untrained peer. Yet upon consideration of these data in conjunction with the data regarding the gain in the frequency of responses to the same peer (p. 141), it appears that Joey demonstrated significant gains in overall interaction with his untrained peer.

A second contribution of the two studies in this dissertation is the measurement of social validity of the intervention outcomes (Foster & Mash, 1999; McCann Sawyer, Luiselli, Ricciardi & Gower, 2005). The measure selected was a “naïve observer” evaluation (Hayes & Haas, 1988) regarding the changes in both macrostructure (i.e., extended interactions) and microstructure (i.e., responses and initiations). This method of providing social validation has been also been suggested by various researchers as a feasible method of investigating the social validity of intervention outcomes (e.g., Goldstein et al., 2007; Hayes & Haas, 1988; Kaderavek & Justice, 2010; Wolf, 1978). In the current study, five undergraduate students in a language development class at a community college were asked to observe two-minute long videotaped play sessions and complete a questionnaire concerning various aspects of the target children’s interaction.
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(Appendix F). Each videotaped interaction presented a child with ASD interacting with one peer at baseline and the same peer at maintenance that were randomly presented. These observers, who were blind to the experimental condition, all had experience with young children and appeared well aware of what was considered age-appropriate social behaviours. Using lay, naïve observers removes the validation process from being the domain of potentially-biased parties and allows a “common sense” view, in addition to a “scientific”/”professional” view, to be expressed (Scherer & Olswang, 1989). The observers all reported that the target children interacted with peers, shared play materials, responded to peers, initiated play, took turns, and engaged in extended interactions more frequently at maintenance than at baseline. A series of six nonparametric Wilcoxon Signed Ranks tests was conducted to examine the ratings for each item of the rating scale. Results of the analysis confirmed that observers consistently gave significantly higher ratings to the maintenance videotapes (Appendix F1), providing external validation for the impact of the intervention strategies on the three children with ASD. Thus the two studies in this dissertation confirm the social validity of the intervention outcomes and indicated that naïve observers were able to accurately identify macrostructure and microstructure treatment outcomes based on viewing videotaped play samples. This suggests that the outcomes measured by this study were large enough to be observable by uninvolved, external viewers.

Third, both studies reported on the selection criteria for the children with ASD. As noted in the Methods section of the dissertation (p. 50), children were eligible for this study only if they satisfied several selection criteria. These criteria included at least average cognitive skills (as assessed by the Brief IQ section of the Leiter International Performance Scale-R, Royd & Miller, 1997) and the demonstration of intentional communication (as evidenced by scores of at least 18 months in the areas of socialization and communication on the Vineland Adaptive
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Behaviour Scales, Sparrow, Bella, & Cichetti, 1984). These criteria were chosen in order to ensure that the children with ASD had the cognitive and social-communication skills to benefit from the intervention. Of course, the more restrictive the criteria, the smaller the number of children who may be viewed as eligible for this intervention.

In this context, and as evidenced in both studies, it should be noted that all the children with ASD demonstrated significant gains in number and length of extended interactions, responses, and initiations using their own baseline performance as a control. Particular attention should be drawn to the success of Jacob who, while satisfying the selection criteria, had notably low pre-intervention scores on the language, communication and socialization scales. This suggests that future studies might investigate whether broadening the selection criteria to include children with lower scores on cognitive and/or social-communication measures reduces the efficacy of the intervention. If it does not, or does not do so significantly, intervention may be made available to a wider pool of children.

Fourth, the two studies reported in this dissertation provided information on the selection and outcomes of peer interventionists. Across all three children with ASD, both peer interventionists appeared to implement the intervention strategies as taught. Peers were selected according to criteria listed in the Methods section of this dissertation (p. 52-53). For example, typically-developing peers were required to have age-appropriate language and social skills (Odom & Strain, 1984); to demonstrate high levels of compliance with adult directives (Sperry et al., 2010); to have expressed interest in the child with ASD (Doyle, Connolly & Rivest, 1980); and to have attended the same classroom as the child with ASD on a regular basis (Odom & Strain, 1986; Sasso et al., 1998).
A close examination of the data represented in Figures 1 and 2 in Chapter 3 and Figures 1 and 2 in Chapter 4 suggests that there may be some variability in the success of the different peers in intervention. It may be the case that differential gains by one peer over the other may be a reflection of the preference of the child with ASD for a specific peer. Although this was not measured in the current study, research reports that children as young as 1 - 2 years of age show definite preferences for specific peers (Howes, 1987). In addition, in young children, the difference in peer success may be attributed to differing learning abilities of peers, or differing abilities in applying the skills learnt. The variation in peer success, while beyond the scope of the current study, might be worth investigating in future research. Future research may focus on identification of those peers most likely to succeed, and on the development of teaching approaches that would better support peers who are struggling to fully implement intervention strategies.

Fifth, the data in the two studies may also provide perspectives on the importance of training early childhood educators to facilitate an effective intervention. Early childhood educators are an essential component in the effort to integrate children with ASD into inclusive settings. Hunt, Soto, Maier, Liboiron, & Bae (2004) suggest that effective implementation of social and communication supports for young children with significant disabilities necessarily requires the collaboration of all members of the team. Researchers have noted that close and continuous monitoring from a trained adult is central to peer-mediated interventions, the adult being required to provide ongoing direction to ensure the quality of the interactions (Odom & Strain, 1986). Moreover, having educators deliver the intervention provides access to preschool peers who are able to interact with the target child in inclusive, naturalistic settings.
All three educators who participated in the study had a 2-year college diploma in early childhood education from a Canadian institution. In addition to courses in child development, the curriculum for an Early Childhood Education (ECE) diploma includes mandatory courses on developmental theory and practice for children with special needs and courses that address theoretical and practical principles of inclusion for children with special needs\(^1\). Furthermore, each of the educators had at least two years’ experience with preschoolers in the childcare setting and at least six months experience with a child with special needs.

Given this extensive training, Canadian trained ECE’s would appear to possess the skills to apply intervention strategies that are designed to create inclusive and responsive learning environments to benefit all children. The data from the current study confirms the presumption that the educators, when given practical direction, sufficient guidance, and specific strategies, can implement interventions that make a difference to the interactions of these children with their peers. In addition, the educators’ perceptions of the intervention indicated that it was easy to use and that they were comfortable using the intervention independently after the direct involvement of the SLP ceased. These findings confirm the conclusions of Kohler, Anthony, Steighner, & Hoyson (2001) who found that preschool teachers could successfully implement similar peer interventions for children with disabilities.

Finally, the two studies in this dissertation provide data on the role of different play contexts in facilitating intervention gains. In both studies, the data was collected for all three target children and their typically-developing peers in two play contexts: playdough and blocks. These two contexts were chosen to allow for replication of play in a naturalistic setting. Playdough and blocks are universal items found in most childcare centres and homes, and use of 

\(^1\)Information obtained from the websites of Humber College (http://www.humber.ca/program/early-childhood-education), Seneca College (http://www.senecac.on.ca/fulltime/ECE.html) and Centennial College (http://www1.centennialcollege.ca/)
toys and activities that are common to the training and non-training settings is likely to facilitate generalization of the skills learnt (Brown & Odom, 1994). For the analysis presented in the current research, the children’s performance was measured by averaging across the play contexts. A priori, it was believed that there would be no meaningful difference in the impact of the intervention in the two play contexts. However, informal observation of the children during their play sessions suggested that all three target children showed higher levels of engagement during block play when compared to the playdough activity. For Joey, this observation was corroborated by an unsolicited comment from his ECE who said “Joey’s interest level and attention is higher with blocks than with playdough”.

These observations are consistent with increased interest in block play evidenced by children with ASD that has been reported in several recent studies (e.g., Dewey, Lord, & Magill, 1988; Legoff & Sherman, 2006; O’Brien & Bi, 1995; Owens, Granader, Humphrey, & Baron-Cohen, 2008), though participants in these studies were children who are older and younger than those considered in this study. For example, Owens et al (2008) evaluated the effectiveness of therapy using Lego© blocks as a social skills intervention with sixteen 6–11 year olds with high functioning autism and Asperger Syndrome and concluded that Lego© appears intrinsically rewarding to children on the autistic spectrum. Dewey, Lord, and Magill (1988) investigated the effect of different play materials on dyads of 13 children with autism between the ages of 5 and 18, and found that blocks and construction materials promoted more complex social interaction than either dramatic or functional materials in play. In a retrospective study, Legoff and Sherman (2006) compared pre- and post-treatment social interaction scores of 60 children aged 10 – 11 years with autism spectrum disorder who participated in LEGO© therapy (N = 60) with a matched comparison sample (N = 57) who received comparable non-LEGO© therapy. Although
both groups made significant gains on the outcome measures, LEGO © participants improved significantly more than the comparison subjects. O’Brien and Bi (1995) investigated the language and interactive styles of ten toddlers in different play contexts: doll house, large motor play, and blocks. The researchers found that playing with blocks created more child language and more complex language than the other contexts.

The data collected for the current study presented in Chapters 3 and 4 suggests that the intervention effected gains in the number and length of extended interactions, and in the number of responses and initiations in both contexts, that is both in block play and in playdough. Whether block play is indeed a superior context for intervention for the preschool age group has little in the way of implications for the main issues considered in this research. However, the impact of different play contexts and their potentially differential effect on the variability of social interactions may be an area of interest for investigation in future research in order to further support and improve intervention outcomes.

**Future directions**

Additional research could extend the scope and the scale of the current study in several ways. First, a randomized control trial (RCT) study could be utilized to verify the effectiveness of the intervention and thereby determine whether it has policy implications. While observational studies, such as the one presented in this dissertation, can play a central role in comparative effectiveness research (Fleurence, Naci, & Jansen, 2010), RCTs are considered a particularly rigorous way of determining whether a cause-effect relationship exists between treatment and outcome (Kraemer, Frank, & Kupfer, 2006). However, while an RCT is a powerful investigative tool, preliminary evidence that the intervention is likely to be beneficial is usually required to
justify the considerable expense of a trial (Sibbald & Roland, 1998). The data reported in the current study, which suggests that the intervention is effective in increasing the social interaction skills of preschoolers diagnosed with ASD, provides the preliminary justification necessary for a broader-based, randomised controlled trial.

A second extension of the current study would be a follow-up study to explore the long-term effects of the intervention. A main feature of the current study is the finding that the children with ASD maintained their gains in social interactions 4 to 5 weeks after the intervention was completed. From the data presented in Study 1, it appears that all three children with ASD demonstrated a marked improvement in the number and length of their extended interactions during play sessions with their trained peers at maintenance testing. Similarly, the data presented in Study 2 suggests that all three children with ASD maintained a marked improvement in responses and initiations with their trained peers at maintenance testing. However, the scope of this study only allowed for measurement of maintenance after 4 – 5 weeks. It would be of great interest to track the children over longer periods to see if gains are maintained as the children grow older and enter school. There is a large body of research that suggests that establishing successful relationships with peers in early childhood is crucial to the development of social competencies (Guralnick, 1994; NIHCD, 2001; Rubin, Bukowski & Parker, 1998). Moreover, children who have had ongoing opportunities to play with peers from an early age are at an advantage when they enter formal group settings such as daycare or public school (Ladd & Price, 1987; Lieberman, 1977). The proposed future research might also examine the longer-term development of the children in terms of their peer-relationships and friendships.

A third research direction includes an examination of different measures of quality. An
extension of the current study might incorporate measures such as topics of conversation, verbal and non-verbal communication, and level of play interactions. These would provide additional useful data for determining the social and communicative impacts of peer-mediated intervention.

Finally, it would be interesting and useful to investigate whether this intervention can be modified for younger children, perhaps as young as 2 1/2 or 3 years of age, who are at a developmental level that invites social intervention. There are now significant efforts to provide earlier diagnosis of ASD (e.g., Landa & Garrett-Mayer, 2006; Zwaigenbaum et al., 2005). Indeed, infants as young as 12 – 18 months are being identified with behaviours concomitant with a diagnosis of ASD. Once such infants are identified, it is important to provide parents and caregivers with options for intervention. Adapting the current intervention to facilitate age-appropriate social communication behaviours for infants with ASD may therefore satisfy an important need.

**Implications**

Several implications can be drawn from the data presented in the current study. First, speech language pathologists should be introduced to peer-mediated intervention in order to implement it in childcare centres. It is within SLP scope of practice to facilitate social communication skills in children with ASD. In the course of their work with preschoolers they are frequently called upon to provide intervention in childcare centres. However, most speech language pathologists who work for publicly-funded agencies (e.g., Preschool Speech and Language Services in Ontario), are limited in the amount of time they can allocate to each client. Hence, interventions that require continued and intensive speech language pathology support are not feasible. The intervention program described in this dissertation, which employs typically-developing children who receive minimal training and support, is practicable and cost-effective.
Given their training and their access to childcare centres, speech language pathologists are well-placed to deliver this intervention.

Second, the findings of this study highlight the need for professional development for educators to support efforts to integrate children with ASD into inclusive settings. In general, despite the trend to integrate children with ASD into early childhood settings, preschool educators are rarely trained to support the social interaction skills of these children (e.g., Anderson, Moore, Godfrey, & Fletcher-Flinn, 2004; Hundert, 2007). The data presented in this study corroborate a growing body of evidence-based interventions (e.g., Banda et al., 2010; Conroy et al., 2007; Kalyva & Avramides, 2005; Kohler et al., 2007; Laushey & Heflin, 2000) that demonstrates that children with ASD are receptive to peer-mediated intervention delivered in a childcare setting. The reported findings are therefore encouraging and underscore the need for specific training for educators.

Finally, parents and primary caregivers of young children with autism should be made aware of the potential of this intervention. Very often when receiving a diagnosis of ASD, parents and primary caregivers appear to have very little choice in the way of effective intervention. Access to publicly funded interventions is difficult, waitlists are long, and time available for individual treatment is limited. In contrast, the intervention documented in the current study could be made easily accessible within the natural settings of childcare centres and appears to have generated considerable gains in the social interaction skills of preschoolers with ASD.

In conclusion, consider an unsolicited comment from a parent of one of the participating children with ASD:
“Lily was a loner. Standing in the room on her own. Or outside at the gate. Now she is following the other children. Look at her conversation – she chats all the time. Came out of her shell. Look at her imaginary play. She learnt what to do and does it. She knows what to do to get the other child to play with her. The change in Lily is amazing.”

March 4, 2005.
References


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Appendix A

UNIVERSITY OF TORONTO
Office of the Vice-President, Research and Associate Provost
Ethics Review Office

PROTOCOL REFERENCE #14006        April 12, 2005

Prof. L. Girolametto          Ms. E. Katz
Dept. of Speech Language Pathology
Grad. Dept. of Rehabilitation Science
500 University Ave., 10th Floor
University of Toronto

Dear Prof. Girolametto & Ms. Katz:

Re: Research Protocol, "Promoting Interactive Communication in Preschool Children with Autism Spectrum Disorder via Peer Intervention" Revised April 29, 2004 by Prof. L. Girolametto (supervisor), Ms. E. Katz (student)

ETHICS APPROVAL

Original Approval Date: December 15, 2003
Annual Reapproval Date: April 12, 2005
Expiry Date: April 11, 2006

We are writing to advise you that a member of the Health Sciences II Research Ethics Board has granted annual re-approval to the above-named research study, under the Board's expedited review process for a period of one year. Ongoing projects must be renewed prior to the expiry date.

We understand there have been no changes to the protocol or consent documents since the most recent approval in 2004.

During the course of the research, any significant deviations from the approved protocol (that is, any deviation which would lead to an increase in risk or a decrease in benefit to human subjects) and/or any unanticipated developments within the research should be brought to the attention of the Office of Research Services.

Best wishes for the successful completion of your project.

Yours sincerely,

Marianna Richardson
Ethics Review Coordinator

xc Prof. P. van Lieshout, Chair, Health Sciences II REB
Prof. L. De Nil, Chair, Dept of Speech Language Pathology
Appendix A

Information and Consent Forms for Early Childhood Educators

Promoting Spontaneous Interactive Communication in Preschool Children with Autism Spectrum Disorder via Peer Intervention

Investigator: Esther Katz, M.Sc. Student, Department of Speech-Language Pathology, University of Toronto.
Contact: Esther Katz, Department of Speech-Language Pathology, 6 Queen's Park Cr. West, Toronto, Ontario, M5S 3H2 Telephone:416 744 7650 ext 234

Introduction

I am conducting a study in order to find an effective way to help children with autism/PDD develop social and communication skills. I hope you will allow me to involve children in your classroom in this effort. Below you will find a detailed description of the study. If you have any questions or concerns, please do not hesitate to contact me.

Purpose of Research

The purpose of this study is to determine if typically developing children can be taught to help children with autism/PDD develop social and communication skills in day care centres. Children with autism/PDD have difficulty in developing communication and social skills. These children are often integrated in daycare centres with typically developing children, with the expectation that they will assimilate the social and communication skills from these children. However, it has been found that children with autism/PDD cannot acquire social and communication skills without further support. Unfortunately, intensive adult support tends to be expensive and is not a viable option for most daycare centres. Moreover, purely adult support may not be sufficient, because children must to learn to interact with other children and not only with adults. One solution to this dilemma is to train typically developing peers to help children with autism/PDD to acquire social and communication skills. In addition to helping resolve the problem faced by children with autism/PDD, this training and subsequent interaction is likely to be of benefit the typically developing children in terms of social and communication skills. The purpose of this study is to determine if this type of intervention can be effectively provided in the daycare setting.

Procedures

You will be asked to give parents information- and consent-forms, and to coordinate collection of the consents. In addition, you will be asked to complete questionnaires to obtain information about the speech, language and social skill development of children in your care who are participating in the study; and information about your education and experience. This background information is needed in order to enable me to analyze the results of the intervention.

You will then be asked to participate in two half-hour training sessions, to familiarize yourself with the intervention procedures, and to help select appropriate children to be peer-interventionists, according to criteria that will be discussed. In this study, I will withdraw three children (one child with autism/PDD and two children who are developing typically) to a quiet room in the childcare for 25 - 30 minutes every day for one week for social skills training. Following the completion of this training, I
will ask you to implement a “buddy system” where a chosen peer-interventionist is asked to be a “buddy” to the target child, and to proceed to play together in two play areas. This “buddy system” will be implemented three times a week for four weeks, according to a set schedule. After the four week period, we will meet to summarize the intervention to date and to set goals for the ensuing 4-5 week period where I will not be present. You will be asked to continue to implement the “buddy system” and to keep a diary to record on each day who the buddy was and to what activities they were directed. I will return to the day care centre after a 4-5 week break for five additional sessions, in order to assess the outcome of the program.

All information will be kept strictly confidential.

**Benefits/Risks/ Discomforts**

Through this training and observation process you would be able to gain some valuable information as to how to implement a social skills training program in your classroom. In addition, if the results of this research are positive they could be used to develop a social skills training program, which could benefit children with autism/PDD in day care centres.

You are free to withdraw from the study at any time during the research. There are no known risks or discomforts to you for participating in this research.

Thank you very much for your help.
ECE Information Form

Name__________________________ Date of Birth______________________________

Years at this centre_______________________________________________________

Years with preschoolers at this center_______________________________________

Total years experience as a preschool teacher_______________________________

Languages spoken____________________________________________________________________________

Primary language spoken outside work________________________________________

Highest high school grade completed (circle one) 12 13/OAC

Years of post-secondary education__________________________________________

Name of diploma/degree________________________________________________________________________

Name of institution where diploma/degree was obtained__________________________

Additional Course work Completed________________________________________________________________

Special Ed. Training: [ ] Yes   [ ] No Year________________________

Hanen Training: [ ] Yes   [ ] No Year_______________________________

Have you had consultation from experts in the field of Special Education?
[ ] Yes   [ ] No (if yes, please elaborate)________________________________________

Have you had consultation from experts in the field of Speech Language Pathology?
[ ] Yes   [ ] No (if yes, please elaborate)________________________________________
Appendix A
Clinical Consent Form for Early Childhood Educators

**Investigator:** Esther Katz, M.Sc. Student, Department of Speech-Language Pathology, University of Toronto.

**Contact:** Esther Katz, Department of Speech-Language Pathology,
6 Queen's Park Cr. West, Toronto, Ontario, M5S 3H2 Telephone: 416 744 7650 ext 234

**Name:**

I acknowledge that the research procedures described on the attached form, and of which I have a copy, have been explained to me and that any questions that I have asked have been answered to my satisfaction. I have been informed of the alternatives to participation in this study. I also understand the benefits and risks of joining the research study. I know that I may ask now, or in the future, any question I have about the study or the research procedures. I have been assured that records relating to me will be kept confidential and that no information will be released or printed that would disclose my personal identity without my permission.

I understand that I am free to withdraw from the study at any time. I further understand that if there is withdrawal at any time, my continued participation in the preschool program will not be affected. I acknowledge that I have been given a copy of the consent form for my own personal use.

I hereby consent to participate in this research.

__________________________                         ______________________
Signature of Early Childhood Educator                      Date

__________________________                         ______________________
Signature of Witness                      Date
Appendix A
Information for Parents of Children with Autism Spectrum Disorder

Investigator: Esther Katz, M.Sc. Student, Department of Speech-Language Pathology, University of Toronto.

Contact: Esther Katz, Department of Speech-Language Pathology, 500 University Ave., Toronto, ON, M5G 1V7
email: esther.katz@utoronto.ca

Introduction
I am conducting a study in order to find a more effective way to help children with Autism Spectrum Disorder develop social and communication skills. I hope you will allow me to involve your child in this effort. Below you will find a detailed description of the study. If you have any questions or concerns, please do not hesitate to contact me.

Purpose of Research
The purpose of this study is to determine if typically developing children can be taught to help children with Autism Spectrum Disorder develop social and communication skills in day care centres. Children with Autism Spectrum Disorder have difficulties developing communication skills and interacting socially with other children. They are often integrated into day care centres with other children who are developing typically. It is expected that children with Autism Spectrum Disorder will learn social and communication skills from their peers. However, it has been found that children with Autism Spectrum Disorder cannot learn social and communication skills without support. Unfortunately, adult support tends to be expensive and is not available in most day care centres. In addition, adult support may not be enough, because children must learn to interact with other children and not only with adults. One solution is to train typically developing peers to help children with Autism Spectrum Disorder to learn social and communication skills. The purpose of this study is to determine if this type of intervention can be effectively used in day care centres.

Procedures
Assessment:
The first step in this research is for me to complete an assessment of your child. I will ask you to complete a General Information Form which will include questions about family background, case history, and medical concerns. I will then meet with you for about one hour, to ask you questions about your child’s development. This information will be used to complete sections of the Vineland Adaptive Behavior Scales, which will provide developmental information regarding your child’s social and language level. In addition, I will observe your child in the day care and I will complete the Childhood Autism Rating Scale (CARS) which will give me information about your child’s behaviour in the day care. I will also ask your child’s teacher to complete a questionnaire that asks about your child's communication and social abilities. In addition, I will complete a speech and language assessment for your child (the Preschool Language Scales (PLS-4) and I will administer the classification subsection of the Leiter-International Performance Scale–R, which is designed to assess the ability of children to form abstract mental representations of concepts. Total direct assessment with each child will be 1 - 1 ½ hours. This background information is needed in order to enable me to analyze the results of the intervention. Also, I will videotape your child 8 times together with a friend at two or three activities, at
the sand table, at blocks, and at playdough. Videotaping will take between 20 and 30 minutes each time, ten minutes at each activity.

Training:
Each day, for one week, I will take your child and three typically developing peers to a quiet space in the day care centre, for a small group training session that will last for 30 minutes. I will tell the children a story about how to play cooperatively and I will model strategies that will encourage interactive play.

Intervention:
After the training is finished I will videotape your child with a partner playing together with playdough and at the sand table for twenty minutes (ten minutes at each activity). The teacher will remind the children about the strategies I taught them during the training week. There will be a total of 18 videotapes taken three times a week for six weeks. After a three week break I will return to the day care centre, for eight additional videotaping sessions, in order to see how the program is being used. If at any time either one of the children being videotaped is uncooperative, videotaping will be discontinued and an additional session will be filmed on another day. This might mean videotaping four times a week with one tape being discarded because task was not completed.

Re-assessment:
During the first week of the three-week break I will return to the child care center in order to ew-assess your child. I will meet with you again, for forty minutes, to ask you questions about your child’s development. This information will be used to complete sections of the Vineland Adaptive Behavior Scales, which will provide developmental information regarding your child’s social and language level. In addition, I will also ask your child’s teacher to complete a questionnaire that asks about your child's communication and social abilities. I will once again administer the classification subsection of the Leiter-International Performance Scale–R. Total direct assessment with each child will be 30 minutes.

As a token of gratitude, I would like to present your child with a sticker book and a reward certificate, when the study is completed.

All information about your child will be kept strictly confidential. The videotapes and test results will be used by the research team only, and will not be shown to anyone else without your permission. Your child’s name will be replaced by a number on all videotape labels, tests and forms used for the research.

Benefits
The aim of this study is to encourage your child to develop communication and play skills. We think that this program will benefit your child. However, we cannot be sure that such benefits will occur. If the results of this research are positive they could be used to develop a social skills training program, which could benefit children with autism/PDD in day care centers.

Risks/Discomforts/Alternatives
There are no known risks or discomforts to you or your child for participating in this research. The training and videotape sessions are designed to be fun and motivating. You are free to withdraw your child from the study at any time during or after the study. Your decision to withdraw will not have any effect on your child’s involvement at the day care centre. If you do not allow your child to participate, your child will continue to be involved in all regular activities in the day care centre.

Thank you very much for your help.
Appendix A

Information Form for Parents of Children who are Developing Typically

**Investigator:** Esther Katz, M.Sc. Student, Department of Speech-Language Pathology, University of Toronto.

**Contact:** Esther Katz, Department of Speech-Language Pathology, 6 Queen's Park Cr. West, Toronto, Ontario, M5S 3H2 Telephone: 416 744 7650 ext 234

**Introduction:**

I am conducting a study in order to find a more effective way to help children with autism (ASD) develop social and communication skills. I hope you will allow me to involve your child in this effort. Below you will find a detailed description of the study. If you have any questions or concerns, please do not hesitate to contact me.

**Purpose of Research**

I would like to ask your child to participate in a training program that could help children with special needs to be integrated into the classroom. One of the children in your child’s classroom has ASD. Children with ASD have difficulties developing communication skills and interacting socially with other children. They are often integrated into day care centres with other children who are developing typically. It is expected that children with ASD will learn social and communication skills from their peers. However, it has been found that children with ASD cannot learn social and communication skills without support. Unfortunately, adult support tends to be expensive and is not available in most day care centres. In addition, adult support may not be enough, because children must learn to interact with other children and not only with adults. One solution is to train typically developing peers to help children with ASD to learn social and communication skills. The purpose of this study is to determine if this type of intervention can be effectively used in day care centres.

**Procedures**

If you agree to have your child participate in this study, he/she may be chosen to be a “buddy” to the child with special needs in his/her classroom. I will ask you to complete a General Information Form, which will provide background information. I will ask your child’s teacher to complete questionnaires that ask about your child’s communication and social abilities, and I will assess your children’s receptive and expressive language skills using standardized measures. This background information is needed in order to enable me to analyze the results of the intervention.

I will videotape your child between two and three times together with the child with ASD at two activities in the day care, at block play and at playdough. Videotaping will take approximately 20 minutes each time, ten minutes at each activity.

After that, I will begin the training program. Each day, for one week, I will take your child with the child with ASD and one other typically developing peer to a quiet space in the day care centre, for a small group training session that will last for 20 – 30 minutes. I will tell the children a story about how to play cooperatively and I will model strategies that will encourage interactive play.

When the training is finished I will videotape your child playing together with the child with ASD at blocks and at playdough for twenty minutes (ten minutes at each activity). The teacher will remind the children about the strategies I taught them during the training week. There will be a total of two videotapes taken weekly for three weeks. After a three-week break I will return to the day care centre, for two additional videotaping sessions, in order to see how the program is being used. If at any time either one of the children being videotaped is uncooperative, videotaping will be discontinued and
an additional session will be filmed on another day. This might mean videotaping three times a week with one tape being discarded because task was not completed.

All information about your child will be kept strictly confidential. The videotapes and test results will be used by the research team only, and will not be shown to anyone else without your permission. Your child’s name will be replaced by a number on all videotape labels, tests and forms used for the research.

As a token of gratitude, I would like to present your child with a sticker book and a reward certificate, when the study is complete.

**Benefits**

The aim of this intervention is to encourage children to develop communication and play skills. We hope that your child will indeed benefit from this intervention. However, we cannot be sure that such benefits will occur. If the results of this research are positive they could be used to develop a social skills training program, which could benefit children with ASD in day care centers.

**Risks/Discomforts/Alternatives**

There are no known risks or discomforts to you or your child for participating in this research. The training and videotape sessions are designed to be fun and motivating. You are free to withdraw your child from the study at any time during or after the study. Your decision to withdraw will not have any effect on your child’s involvement at the day care centre. If you do not allow your child to participate, your child will continue to be involved in all regular activities in the day care centre.

Thank you very much for your help.

Esther Katz, M.Sc.
Appendix A

Clinical Consent Form for Parents of Participating Children

**Investigator:** Esther Katz, M.Sc. Student, Department of Speech-Language Pathology, University of Toronto.

**Contact:** Esther Katz, Department of Speech-Language Pathology, 500 University Ave., Toronto, ON, M5G 1V7
email: esther.katz@utoronto.ca

**Name of Child:** ________________  **Date of Birth:** ________________

I acknowledge that the research procedures described on the attached form, and of which I have a copy, have been explained to me and that any questions that I have asked have been answered to my satisfaction. I have been informed of the alternatives to participation in this study. I also understand the benefits and risks of joining the research study. I know that I may ask now, or in the future, any question I have about the study or the research procedures. I have been assured that records relating to me, my child, and his/her care will be kept confidential and that no information will be released or printed that would disclose personal identity without my permission.

I understand that I am free to withdraw myself and my child from the study at any time. I further understand that if my child does not participate in the study, or if there is withdrawal from it at any time, the quality of care for my child and for other members of my family in the child care will not be affected. I acknowledge that I have been given a copy of the consent form for my own personal use.

I hereby consent to participate in this research.

_________________________                         ______________________
Signature of Parent or Guardian                               Date

_____________________________                         ______________________
Signature of Witness                               Date
Appendix B

Case History Questionnaire for Parents of Children with ASD

Date ____________________________  [ ] M  [ ] F
Child's Name ______________________  D.O.B. (d/m/y) ____________________________
Mother's Name ____________________  Father's Name ____________________________
Mother's Year of Birth ________________  Father's Year of Birth ______________________
Address.____________________________________________________________________________
___________________________________________________________________________
Phone: Home_________________ Work: Mother___________ Work: Father______________
Mother's Occupation_________________  Father's Occupation____________________
Mother's highest level of education (e.g., high school, college, university)_____________________
Father's highest level of education (e.g., high school, college, university)_____________________
Family Doctor/Pediatrician:_________________________________________________________

FAMILY
Who lives in the home with the child? (Please continue list on additional page if necessary.)

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Relationship</th>
<th>Language spoken to to child</th>
<th>Language spoken to child most of the time</th>
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</table>

Languages spoken between parents________________________________________________________

Please list names and ages of any siblings not living in home with child
________________________________________________________

Do any siblings or other family members siblings have a learning difficulty?      [ ] Yes  [ ] No
If yes, please describe__________________________________________________________________________

1 Adapted with permission from General Information Form - “More Than Words Program” The Hanen Centre
**SCHOOL**
Child's day care/pre-school _______________________________________________________
Teacher's name ________________________________________________________________
How long has your child been attending this day care?
[ ] Full-time ____________________ [ ] Part-time____________________________

**MEDICAL**
Medical diagnosis if applicable (PDD, cerebral palsy, hydrocephalus, down syndrome, seizures, etc.)
___________________________________________________________________________
Who provided this diagnosis? _________________________________________________
When was the diagnosis provided? ____________________________________________
Please provide any significant information regarding your child's birth, health during infancy, allergies, seizures, hospitalizations, etc ________________________________________________________________
__________________________________________________________________________

**HEARING**
Does your child have a history of hearing difficulties? [ ] Yes [ ] No
Results of latest hearing tests _________________________________________________
When and where were these tests done?___________________________________________
Has your child had any ear infections/congestion requiring medication and/or tubes?________

**VISION**
Does your child have any visual difficulties? [ ] Yes [ ] No
Results of latest visual tests ____________________________________________________
When and where were these tests done?___________________________________________

**MOTOR**
Does your child have gross or fine motor difficulties? [ ] Yes [ ] No
Please describe any difficulties in walking, manipulating toys, feeding__________________
___________________________________________________________________________
Is s/he getting help? [ ] Yes [ ] No
If yes, please describe___________________________________________________________

**BEHAVIOUR**
Does your child have any behavioural difficulties? [ ] Yes [ ] No
(e.g., tantrums, aggressive behaviour, extreme shyness, etc.)
If yes, please explain___________________________________________________________
Is s/he getting help? [ ] Yes [ ] No
If yes, please describe

**COMMUNICATION ASSESSMENTS**

<table>
<thead>
<tr>
<th>Date</th>
<th>Name of Person/Agency</th>
<th>Comments/Results</th>
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**COMMUNICATION TREATMENT/THERAPY**

Please check any of the following services that you have received in the past or are currently receiving with or for your child.

<table>
<thead>
<tr>
<th>Name of Program</th>
<th>Yes, have participated</th>
<th>No, have not participated</th>
<th>When: Dates</th>
<th>How long: # weeks or sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPSLS SLP services - parent training</td>
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<tr>
<td>Private SLP services - parent training</td>
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<tr>
<td>TPSLS SLP services - for child only</td>
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<td>Private SLP services - for child only</td>
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<tr>
<td>PECS training</td>
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<tr>
<td>Geneva Centre: Indicate lecture</td>
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<tr>
<td>Indicate lecture</td>
<td>social</td>
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<td></td>
<td>toileting</td>
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<td></td>
<td>language</td>
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<td>other</td>
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<tr>
<td>Special Schools:</td>
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<tr>
<td>Play &amp; Learn</td>
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<tr>
<td>West End Creche</td>
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<tr>
<td>Silvercreek</td>
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<tr>
<td>Yes I Can</td>
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<tr>
<td>Adventure Place</td>
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<tr>
<td>Other (specify)</td>
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<tr>
<td>Community Living Toronto (TACL)</td>
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<tr>
<td>Surrey Place</td>
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<td>TPAS - ABA or IBI</td>
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<td>Private ABA or IBA</td>
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<tr>
<td>New Haven</td>
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<tr>
<td>Beecroft</td>
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<tr>
<td>TRE-ADD (Thistletown)</td>
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</table>
**OTHER ASSESSMENTS**
Please list any other assessments your child has received, e.g. developmental, occupational, hearing.

<table>
<thead>
<tr>
<th>Date</th>
<th>Name of Person/Agency</th>
<th>Comments/Results</th>
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Please describe any other treatment or therapy your child has received.

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<th>Date</th>
<th>Name of Person/Agency</th>
<th>Description</th>
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</table>
DEVELOPMENTAL HISTORY
When did you become concerned about your child’s communication?
____________________________________________________________________________________
____________________________________________________________________________________

Please describe at what age your child started:
Crawling: _____________________________ Walking:_______________________________
Feeding him/herself: ____________________ Dressing him/herself:_____________________
Toilet training (completed):________________________

First words:____________________________ 2 word phrases:_________________________
Sentences: ____________________________

YOUR NEEDS AND CONCERNS
What are your top four concerns right now, related to your child’s communication and/or general development, which are affecting you and your family?

1._____________________________________________________________________________
_______________________________________________________________________________

2._____________________________________________________________________________
_______________________________________________________________________________

3._____________________________________________________________________________
_______________________________________________________________________________

4._____________________________________________________________________________
_______________________________________________________________________________

Completed by:__________________________________ Date:____________________________

Parents' signatures:________________________________ Date:____________________________

________________________________ Date:____________________________
Appendix B

Social Interaction Assessment Scale²

Rater's Name:
Date:
Child's Name:
Date of Birth:

Please rate this child's social interactions compared to other children his or her own age.

1. This child's ability to interact well with peers is:

   | 1 | 2 | 3 | 4 | 5 |
   | very | normal | very | low | for age | high |

2. This child's ability to initiate cooperative play with peers is:

   | 1 | 2 | 3 | 4 | 5 |
   | very | normal | very | low | for age | high |

3. This child's ability to respond to play invitations from peers is:

   | 1 | 2 | 3 | 4 | 5 |
   | very | normal | very | low | for age | high |

4. This child shares play materials with peers:

   | 1 | 2 | 3 | 4 | 5 |
   | not at all | normal | very | for age | often |

5. This child takes turns when playing:

   | 1 | 2 | 3 | 4 | 5 |
   | not at all | normal | very | for age | often |

6. This child continues an interaction once he/she has begun:

1 2 3 4 5
not at normal very
all for age often

7. Peers seek out this child for social play:

1 2 3 4 5
not at normal very
all for age often

8. This child has expressed interest in/ approached __________ in the past month:

1 2 3 4 5
not at sometimes very
all often

9. This child follows adult direction:

1 2 3 4 5
not at normal very
all for age often

10. This child seeks adult approval:

1 2 3 4 5
not at normal very
all for age often
Appendix B

Case History Questionnaire for Parents of Children who are Developing Typically\textsuperscript{3}

Date ________________ [ ] M [ ] F
Child's Name __________________________ D.O.B. (d/m/y) __________________________
Mother’s Name __________________________ Father’s Name __________________________
Mother's Year of Birth __________________________ Father's Year of Birth __________________________
Address. __________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Phone: Home_______________ Work: Mother_______________ Work: Father_________________
Mother's Occupation ______________________ Father's Occupation ______________________
Mother's highest level of education (e.g., high school, college, university) ______________________
Father's highest level of education (e.g., high school, college, university) ______________________
Family Doctor/Pediatrician: __________________________

FAMILY
Who lives in the home with the child? (Please continue list on additional page if necessary.)

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Relationship to child</th>
<th>Language spoken to child most of the time</th>
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</table>

Languages spoken between parents

Please list names and ages of any siblings not living in home with child

________________________________________

________________________________________

Do any siblings or other family members have a learning difficulty? [ ] Yes [ ] No
If yes, please describe ________________________________________________________________

CHILD CARE/PRESCHOOL
Child's daycare/pre-school ___________________________________________________________
Teacher's name ____________________________________________________________

\textsuperscript{3} Adapted with permission from General Information Form - “More Than Words Program”, The Hanen Centre
How long has your child been attending this daycare?
[ ] Full-time ____________________  [ ] Part-time ____________________

HEARING
Does your child have a history of hearing difficulties?  [ ] Yes  [ ] No
Results of latest hearing tests ________________________________________________________
When and where were these tests done? _________________________________________________
Has your child had any ear infections/congestion requiring medication and/or tubes? _______
__________________________________________________________________________________

COMMUNICATION
Does your child have a history of speech and/or language difficulties?  [ ] Yes  [ ] No
Has your child had a speech and language assessment?  [ ] Yes  [ ] No
If yes, when and where were these tests done? _________________________________________
__________________________________________________________________________________
What were the results?
__________________________________________________________________________________
Has your child had speech and language intervention?  [ ] Yes  [ ] No
If yes, when and where? ___________________________________________________________
__________________________________________________________________________________

DEVELOPMENTAL HISTORY
Please describe at what age your child started:
Crawling: _____________________________  Walking: _____________________________
Feeding him/herself: ____________________  Dressing him/herself: ____________________
Toilet training (completed): _________________________________________________________
First words: ___________________________  2 word phrases: ________________________
Sentences: _____________________________

Completed by: __________________________________________  Date: ________________________
Parents' signatures: _______________________________________  Date: ________________________
____________________________________  Date: ________________________
Appendix B
Standardized Measures used for Pre-Intervention Assessment


The Preschool Language Scales-4 is a diagnostic measure of language development, and is widely used to assess receptive and expressive language skills (e.g., Craig-Unkefer & Kaiser, 2002; Timler, Vogler-Elias, & McGill, 2007; Wolery & Garfinkle, 2002). The PLS-4 comprises two subscales: the Auditory Comprehension (AC) subscale, which is used to assess the child's ability to understand spoken language, and the Expressive Communication (EC) subscale, which is used to assess the child's ability to communicate with others. Items at the preschool level of the AC subscale assess comprehension of basic vocabulary, concepts, and grammatical markers. Preschool level items on the EC subscale ask children to name and describe common objects, express quantity, and to use prepositions, grammatical markers, and appropriate sentence structure. The PLS-4 yields three norm-referenced scores: AC score, EC score, and Total Language (TL) score (a composite of AC and EC). Interrater reliability correlations were found to be .99. Evidence of test-retest reliability supports consistency of scores, with stability coefficients ranging between .82 and .95 for the subscale scores and .90 to .97 for the Total Language Scale. Internal consistency is high with Crohnbach’s alpha coefficients for ages 3.0 to 5.11 ranging from .83 to .94 for the AC scale, from .92 to .95 for the EC scale, and from .94 to .97 for the Total Language Scale. Concurrent validity evidence indicates that the PLS-4 is correlated with the PLS-3 with correlation coefficients of .65 and .79 for the AC and EC scales respectively.
b) The Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter and DiLavore, 1999)

The Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter and DiLavore, 1999) is a semi-structured, standardized assessment of communication, social interaction, play, and imagination designed for use in the diagnostic evaluations of individuals referred for a possible Autism Spectrum Disorder. The ADOS has four modules, and the module for administration is chosen according to the developmental and language level of the child. Modules 1 and 2 are appropriate for young pre-school children and were used in this study. There are ten sets of materials and play activities in Module 1 appropriate for children with no speech or single words, and 14 activities in Module 2 suitable for more fluent young children with phrase speech, from which around 30 behaviours are coded on a 3 or 4 point scale. Selected items relating to social interaction and communication are then entered into an algorithm. These scores are transformed following the protocol in the manual for the diagnostic algorithms. To obtain an ADOS classification of Autism or ASD, an individual’s scores must meet the cut-off for the summation of the communication and social domains. In Module 1 the cut-off score for ASD is 7 and for autism, 12. In Module 2, the cut-off score for ASD is 8, and for autism, 12. Lord et al. (2000) found inter-rater reliability for the ADOS to be very high, exceeding 80% agreement for all items. Test-retest reliability was assessed for a sample of children who were administered the ADOS twice within an average of 9 months. Correlations yielded indicated excellent stability, with mean absolute differences in scores at times 1 and 2 ranging from 1.19 in the communication domain to 1.78 in the social domain. Internal consistency is high: Crohnbach’s alpha coefficients are 0.86 – 0.91 for the social domain (modules 1 and 2) and 0.74 – 0.84 for communication (modules 1 and 2). Reported alpha coefficients for repetitive behaviours is low, 0.63 – 0.65 for modules 1 and 2, however, repetitive behaviour scores are not used in the
calculation of the diagnostic algorithm (Lord et al., 2000). Concurrent validity with clinical classification according to DSM–IV-TR criteria (American Psychiatric Association, 2004) was shown to be high (i.e., 74-75%) (de Bildt, Sytema, Kraijer, & Minderaa, 2005).
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c) *The Childhood Autism Rating Scale (CARS, Schopler, Reichler, & Renner, 1986)*

The CARS, a behaviorally based clinical evaluation of behavior (Paul, 2001), is used extensively in clinical settings for the diagnosis of autism. The CARS rates a child on 15 items that include relationship to people, imitation, emotional response, body use, object use, adaptation to change, visual response, listening response, taste-smell-touch response and use, fear and nervousness, verbal communication, non-verbal communication, activity level, level and consistency of intellectual response, and general impressions. Behaviors are rated on each of these items from 1 (age-appropriate behavior) to 4 (severely autistic behavior). According to the CARS norms, a total score of 30 and above is indicative of autism. Total scores of 30 to 36.5 indicate mild/moderate autism, and scores of 37 and above indicate severe autism. Interrater reliability obtained is moderate with an interrater reliability score of .71. Test-retest data (n = 91) collected at a 1-year interval resulted in a correlation coefficient of .88 (p<.01). Internal consistency is high with a Crohnbach’s alpha coefficient of .94. Criterion-related validity, which was determined through a comparison to independent clinical ratings by child psychologists and psychiatrists, was high, with a correlation of .80 (p<.001).
d) The Vineland Adaptive Behavior Scales (VABS, Sparrow, Balla, & Cicchetti, 1984) - Socialization and Communication domains

The VABS assesses the adaptive behavior of handicapped and non handicapped individuals from birth through age 19. The Communication Domain samples receptive, expressive, and written communication skills, whereas the Socialization Domain focuses on interactions with others, including play, use of free time, and responsibility and sensitivity to others. Interrater reliability coefficients for the VABS range from .62 for the Socialization Domain to .75 for the Communication Domain. Test-retest reliability coefficients (with a 2- to 4-week retest interval) for the Communication Domain was between .86 -.89, and between .78 -.88 for the Socialization Domain. Crohnbach’s alpha coefficient for the Communication Domain was between .89 -.93, and between .84 -.92 for the Socialization Domain. Concurrent validity was established by correlating the Vineland Adaptive Behavior Scales with various tests. An r = .55 was reported with the original Vineland. With normal samples, correlations between the Vineland Adaptive Behavior Composite and several intelligence and ability tests were as follows rs = .32 and .37 with the Kaufman Assessment Battery for Children (K-ABC) Mental Processing and Achievement scales, respectively, and r = .28 with the Peabody Picture Vocabulary Test--Revised (PPVT-R, Dunn & Dunn, 1997).
The Leiter-R was developed as a reliable and valid nonverbal measure of intellectual ability to assess children who cannot be assessed reliably with traditional intelligence tests. The Leiter-R assesses in a nonverbal way the cognitive development of special populations of individuals aged 2 years up to 21 years for whom the usual tests of cognitive abilities may be inappropriate. No verbal instructions are given and no verbal responses required, the person tested needing only to point or place cards in appropriate locations. The four subtests, Figure Ground, Form Completion, Sequential Order, and Repeated Patterns comprise the Brief IQ Screener which is used to provide a reliable estimate of the global intellectual level of subjects (Royd & Miller, 1997). Test-retest correlations for these subtests range between .70 to .81 for children 2 to 5 years of age. The internal consistency reliability coefficients for the subtests in the Brief IQ Screener (Cronbach’s alphas) for 3-, 4- and 5-year old children are as follows: for the Figure Ground subtest, Cronbach’s alphas range between .73 and .74; for the Form Completion subtest, Cronbach’s alphas range between .87 and .91; for the Sequential Order subtest Cronbach’s alphas range between .66 and .79; and for the Repeated Patterns subtest, Cronbach’s alphas range between .75 and .81. The Leiter-R Brief IQ is correlated with the WISC-III Full Scale and Performance IQs with a correlation coefficient of .85.
### Table B1
*Social Interaction Assessment Scale Ratings for Children with ASD*

<table>
<thead>
<tr>
<th>Item on assessment scale</th>
<th>Lily</th>
<th>Jacob</th>
<th>Joey</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interacts well with peers</td>
<td>2.0</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>2. Initiates cooperative play</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>3. Responds to play invitations</td>
<td>2.0</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>4. Shares play materials</td>
<td>3.0</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>5. Takes turns while playing</td>
<td>3.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>6. Engages in extended interaction</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>7. Peers seek out this child for social play</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Mean Social Interaction Rating</td>
<td>2.1</td>
<td>1.6</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Note.* Questions were rated on a 5-point Likert scale, with 1=not at all; 3=normal for age; 5=very often.
Table B2

*Pre-intervention Ratings for Typically-developing Peers on the Social Interaction Assessment Scale (adapted from McConnell and Odom, 1999) by Early Childhood Educators*

<table>
<thead>
<tr>
<th>Item</th>
<th>Lily’s Peers P1</th>
<th>Lily’s Peers P2</th>
<th>Lily’s Peers P3</th>
<th>Jacob’s Peers P1</th>
<th>Jacob’s Peers P2</th>
<th>Jacob’s Peers P3</th>
<th>Joey’s Peers P1</th>
<th>Joey’s Peers P2</th>
<th>Joey’s Peers P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interacts well with peers</td>
<td>3.0</td>
<td>4.0</td>
<td>4.0</td>
<td>5.0</td>
<td>4.0</td>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>2. Initiates cooperative play</td>
<td>3.0</td>
<td>3.0</td>
<td>5.0</td>
<td>5.0</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3. Responds to play invitations</td>
<td>4.0</td>
<td>4.0</td>
<td>3.0</td>
<td>5.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>4. Shares play materials</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.5</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>5.0</td>
<td>4.0</td>
</tr>
<tr>
<td>5. Takes turns while playing</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.5</td>
<td>4.0</td>
<td>4.0</td>
<td>5.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>6. Engages in extended</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interaction</td>
<td>3.0</td>
<td>4.0</td>
<td>3.0</td>
<td>5.0</td>
<td>4.0</td>
<td>3.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>7. Peers seek out this child for social play</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>5.0</td>
<td>4.0</td>
<td>3.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Mean Social Interaction Rating</td>
<td>3.4</td>
<td>3.8</td>
<td>3.8</td>
<td>4.9</td>
<td>4.0</td>
<td>3.4</td>
<td>4.1</td>
<td>4.6</td>
<td>3.9</td>
</tr>
</tbody>
</table>

*Note.* Questions were rated on a 5-point Likert scale, with 1=not at all; 3=normal for age; 5=very often.
Appendix C

Social Skills Intervention Manual

Overview

The objective of this intervention is to train typically developing children to encourage social play interaction in peers with Autism Spectrum Disorder (ASD). The intervention consists of four consecutive parts: (a) Two half-hour Early Childhood Educator (ECE) training meetings, (b) a social skills training program involving the children with ASD and two typically developing peers, (c) an implementation phase which will be conducted over four – five weeks immediately following the social skills training program, and (d) four half-hour support meetings for the ECE.

The settings and materials for each of the phases of the intervention and the data collection are summarized in Appendix C1.

ECE Training Meetings

Setting and materials. These two 30 minute meetings, which involve the interventionist and the ECE, will take place in the staff room of the child care, or in another quiet space in the child care centre. Materials for these meetings will include the book “Franklin’s New Friend” (Bourgeois, 1997), modifications to the text of “Franklin’s New Friend” (Table C2), the Social Skills Picture Boards (Figure 2, Figure 3), the specific scripts to be used to invite the children to the baseline social skills training, implementation, and generalization sessions (Table C3) and the specific scripts to be used to prompt and praise the children (Table C4). In addition, the interventionist will ask the educator to complete the ECE Information and Consent Form.
(Appendix A) and to give information packages and consent forms (Appendices A,B) to the parents of the nominated typically developing children.

Meeting 1. During this session the interventionist will explain the purpose of the intervention and the theoretical background that led to the development of the different features of the intervention. The interventionist will discuss the recruitment of typically-developing peers in the classroom with the ECE and outline the eligibility criteria for the typically-developing peers. The interventionist will then review this manual with the ECE and train the ECE to co-lead the Social Skills Training Program. During this meeting, the following topics will be reviewed: (a) the specific roles for the ECE and for the interventionist during the Social Skills Training Program, (b) the scripts for inviting the children to the baseline, social skills training, implementation, and generalization sessions (Table C3), (c) the Social Skills Picture Boards (Figure 2, Figure 3) and the rationale underlying their development, and (d) the book, “Franklin’s New Friend” (Bourgeois, 1997), and (e) an explanation of the modifications to the text (Table C2) which were designed to encourage the children to verbalize and empathize with the feelings and actions of the main characters.

Meeting 2. During this meeting the ECE and the interventionist will practise the assigned roles for co-leading the social skills training program and review the protocol and scripts (Table C4) for prompting and praising the children during the implementation phase. The interventionist will answer any questions relating to the intervention.

Social Skills Training Program

The goal of this training program is to teach typically developing peers and the child with ASD to initiate interactions with peers in order to include them in play situations and to respond
to peers in order to maintain the interaction. Training will be applied to all three children equally, and each child will have the opportunity to learn the strategies and to practise their application in a structured play situation. Target children (children with ASD) may need extra support and scaffolding in order to participate in the practice role-play sections, but otherwise they will participate in the training sessions on an equal basis with the two selected typically developing peers, and will not be singled out in any way. Social skills training program sessions are summarized in Table C5.

Setting and materials. This program will involve the child with ASD, his/her two typically developing peers, the ECE, and the interventionist. The program will be delivered in 30-minute sessions on five consecutive days in the classroom, at a time when other children are in the playground or in a different room in the childcare centre. For these sessions materials will include the book, “Franklin’s New Friend” (Bourgeois, 1997), the two Social Skills Picture Boards (Figure 2, Figure 3), 10 individual prompt cards depicted on 9cm x 9cm cards, two puppets representing Franklin, and two representing Moose. In addition, toys that are commonly found in preschool settings, specifically, four matchbox toy cars, eight wooden blocks, and a lift-out Franklin peg puzzle with five pieces, will be used. Also, cardboard cut-out hands, measuring approximately 16cms x 23cms, and mounted on wooden popsicle sticks, will be given to the children to encourage them to participate in the songs that begin and end each of the social skills training sessions. A stamp or sticker will be given as reward to all the children at the end of each 30-minute training session. At the end of each social skills training session the ECE and the interventionist will complete a checklist that examines the key points that were targeted during each social skills training session (Table C6).
Session 1.

Introduction:

The ECE will ask the three children (child with ASD and two peers) to join her and the interventionist in the designated “quiet space” in the child care center using the appropriate script (Table 8).

1. Children will be seated in a semi-circle, facing the ECE and the interventionist.

2. The ECE will introduce the interventionist, and will explain that they have been chosen to be in the “special circle” for the whole week. In addition, the ECE will tell the children that the interventionist will be “leading the circle” with them this week, and that circle will consist of a welcome song, a story, some puppet play, and a good-bye song. They will also be told that at the end of the session they will get a special stamp or sticker on their hands.

3. The ECE will ask Child 1 (typically developing child) to give the other children a “hand” cut-out with his/her name written on it, and will be encourage the child to say: “Here, Jimmy. Take the hand.” The ECE and the interventionist will sing the “Hello” song, using the hand cut-outs. It is important to emphasize each child’s name while singing, and to encourage all the children to sing. “Good morning, Jimmy, good morning Jimmy….etc.

4. The ECE will ask the children to return hand cut-outs to interventionist.

Story:

1. The interventionist will read “Franklin’s New Friend” to the children.

2. The ECE will introduce puppets of Franklin and Moose to the children. Each child will choose a puppet of either Franklin or Moose to hold during the story re-reading.

3. The interventionist will re-read “Franklin’s New Friend” with the modifications (Table 7), pausing to allow the children to participate in telling the story. These modifications
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were designed to promote active rather than passive participation in the story, and the ECE will encourage the children to verbalize and empathize with the feelings and actions of the characters, on behalf of the puppets they are holding. These modifications include cloze statements (e.g., “Franklin was scared, because Moose was so ……”), recall prompts (e.g., “What did Franklin say? He said:……”), and wh-questions (e.g., “Who do you think made the poster?”). The ECE will prompt the children to answer the questions and complete the statements when necessary.

4. Emphasis during reading will be on how the characters feel (e.g., Mother’s expectation of Franklin to “be nice”, Franklin trying to smile although he is scared, Franklin’s relief when Moose refuses his invitation to play, Moose standing alone during recess).

5. The interventionist will also emphasize the characters’ “helping” actions (e.g., Franklin inviting Moose to draw, Franklin and Moose playing together, Franklin and Moose sitting side by side, Franklin showing Moose how to borrow books, Moose showing Franklin how to cut a perfect circle, Franklin introducing Moose to his other friends, Franklin taking cookies to Moose).

6. The interventionist will summarize the story, highlighting the pertinent details (e.g., Franklin did not really like Moose at the beginning, Moose was not comfortable in the classroom, Franklin invited to Moose to join in activities, both characters enjoyed the interactions).

Good bye:

1. The ECE will ask Child 1 (typically developing child) to give each other child a “hand” cut-out with his/her name written on it, and will encourage the child to say: “Here, Jimmy. Take the hand.”.
2. The ECE and the interventionist will sing “good bye song” emphasizing each child’s name while singing, and encouraging all the children to sing along.

3. Interventionist will thank children for participating in the group, and remind them that they will meet again the next day.

4. Each child will receive a stamp on his/her hand.

Session 2.

Introduction:

1. The ECE will ask the three children (child with ASD and two peers) to join her and the interventionist in the designated “quiet space” in the child care center using the appropriate script (Table 8).

2. Children will be seated in a semi-circle, facing the ECE and the interventionist.

3. The ECE will ask Child 2 (typically developing child) to give each other child a “hand” cut-out with his/her name written on it, and will be encourage the child to say: “Here, Jimmy. Take the hand.”

4. The ECE and the interventionist will sing the “Good Morning” song, using the hand cut-outs, encouraging all the children to sing and emphasizing each child’s name while singing.

5. Child 2 will collect hand cut-outs and return them to interventionist.

Story:

1. Each child will choose a puppet of either Franklin or Moose to hold during the story reading.
2. The interventionist will read “Franklin’s New Friend” with the modifications (Table 7), pausing to allow the children to participate in telling the story. The ECE will encourage each child to take on the role of the puppet they are holding and to voice the character’s feelings and actions as the story progresses (e.g., “What did Franklin say? He said, I’m feeling so……...”).

3. Similar to Session 1, emphasis during reading will be on how the characters feel (e.g., Mother’s expectation of Franklin to “be nice”, Franklin trying to smile although he is scared, Franklin’s relief when Moose refuses his invitation to play, Moose standing alone during recess), and on the characters’ “helping” actions (e.g., Franklin inviting Moose to draw, Franklin and Moose playing together, Franklin and Moose sitting side by side, Franklin showing Moose how to borrow books, Moose showing Franklin how to cut a perfect circle, Franklin introducing Moose to his other friends, Franklin taking cookies to Moose).

4. The ECE will also encourage the children to use their characters’ voices to engage the other puppet in the activity depicted in the story (e.g., “Franklin wanted Moose to colour the poster with him. What did Franklin say? He said: I want …...”). The ECE will use cloze statements, recall prompts, and wh-questions to facilitate appropriate responses.

5. The ECE will then engage the children in a discussion about the story, including the following topics: Franklin not really liking Moose at the beginning – what does Franklin say?; Moose not being comfortable in the classroom -- what does Moose say?; What does Franklin do in order to make Moose feel comfortable?.

6. The interventionist will ask the children to suggest different joint activities for Franklin and Moose (e.g., playing with cars). She will also ask what Franklin or Moose could have said in order to encourage a peer to engage with them in that specific activity (e.g., “Here is
a red car. Let’s go for a ride”). The ECE will model responses and prompt the children as necessary.

7. The children will return the puppets to the interventionist.

Good bye:
1. ECE will ask Child 2 to give out the hands using peers names.
2. ECE and interventionist will sing “good-by song” emphasizing each child’s name, while singing, and encouraging all the children to sing along.
3. The interventionist will thank the children for participating in the group, and remind them that they will meet again the next day.
4. Each child will receive a reward stamp on his/her hand.

Session 3.
Introduction
1. The ECE will ask the three children (child with ASD and two peers) to join her and the interventionist in the designated “quiet space” in the child care center using the appropriate script (Table 8).
2. Children will be seated in a semi-circle, facing the ECE and the interventionist.
3. The ECE will ask Child 3 (child with ASD) to give each other child a “hand” cut-out with his/her name written on it, and will be encourage the child to say: “Here, Jimmy. Take the hand.”
4. The ECE and the interventionist will sing the “Good Morning” song, using the hand cut-outs, encouraging all the children to sing and emphasizing each child’s name while singing.
5. Child 3 will collect hand cut-outs and return them to interventionist.

Story:

1. The ECE will give puppets of Franklin and Moose to the 3 children, giving Franklin to the child/children who had Moose during session 2 and Moose to the child/children who had Franklin during session 2.

2. The ECE will open “Franklin’s New Friend”, and the interventionist will encourage the children to tell the story, page by page, prompting them to use the “words” of the characters they were holding.

3. The interventionist will introduce the first social skills prompt page (Figure 2). This page has 5 pictures which depict strategies the children can use to initiate interactions with their peers: “I want to play”; “please help”; “come play”; give a toy; and/or tap the shoulder.

4. Using these strategies the interventionist will engage the children in a discussion about initiating interactions with peers. For example, the interventionist will say: “Franklin wanted Moose to be his buddy. What could he say to Moose?”.

5. The ECE will prompt each child to respond, using the strategies depicted on the board, role-playing with the puppets. For example, the ECE will say: “Jonny, you pretend to be Franklin. What can you say to Moose? -- look, Mary is being Moose!”.

6. The ECE and the interventionist will model scripts for children as necessary.

7. The children will return the puppets to the interventionist.

Good bye:

1. ECE will ask Child 2 to give out the hands using peers names. ECE and interventionist will sing “good bye song” emphasizing each child’s name, while singing, and encouraging all the children to sing along.
2. The interventionist will thank the children for participating in the group, and remind them that they will meet again the next day.

3. Each child will receive a reward stamp on his/her hand.

**Session 4.**

**Introduction:**

1. The ECE will ask the three children (child with ASD and two peers) to join her and the interventionist in the designated “quiet space” in the child care center using the appropriate script (Table 8).

2. Children will be seated in a semi-circle, facing the ECE and the interventionist.

3. The ECE will ask Child 1 (typically developing child) to give each other child a “hand” cut-out with his/her name written on it, and will be encourage the child to say: “Here, Jimmy. Take the hand.”

4. The ECE and the interventionist will sing the “Good Morning” song, using the hand cut-outs, encouraging all the children to sing and emphasizing each child’s name while singing.

5. Child 1 will collect hand cut-outs and return them to interventionist.

**Story:**

1. The ECE will give puppets of Franklin and Moose to the 3 children, giving Franklin to the child/children who had Moose during session 3 and Moose to the child/children who had Franklin during session 3.

2. The ECE will review the picture prompts designed to promote initiations (Figure 2) with the children by asking: “what can you do to get a friend to play with you?” The ECE
will refer the children to the picture prompts, and will remind the children of different ways to “ask a friend to play”, referring to Franklin story.

3. The interventionist will introduce the second social skills prompt page (Figure 3). This page has 5 pictures which depict strategies the children can use to maintain interactions with their peers: “let’s play more”; “good job!”; “my turn/your turn”; “do it again”; and “I like that!”.

4. The interventionist will discuss how Franklin and Moose maintain play interactions using each of these strategies. For example, the interventionist will say: “Franklin and Moose were playing, and Franklin wanted to play some more with Moose. So he said, “Let’s play more!”.

5. The ECE will practice each of the strategies with each child in turn. For example, she could say: “Franklin wants Moose to build some more with him. What should he say?” If the child does not respond, I will model an appropriate response, pointing to the appropriate strategy depicted on the board: “Franklin can say: “Do it again, Moose!””. The ECE will reinforce the model.

6. The children will return the puppets to the interventionist.

Practice:

1. The interventionist will then present the small cars, the blocks, and the lift-out peg puzzle. These toys were chosen to facilitate opportunities for the children to rehearse the strategies learnt.

2. The ECE will offer an activity to each child in turn, and ask the child to engage a peer in play, i.e., to initiate an interaction, using one of the strategies. For example, the ECE will give one of the children the toy cars, saying: “Here are the cars. How can you get Joey to play
with you and the cars?” If the child does not respond, the ECE will model an appropriate response using the Social Skills Picture Boards (e.g., “Look, you can say, ‘Here is a car. Come play.’ Try saying that to Jonny.”).

3. The ECE will also ask each child to practice each of the maintenance strategies with the other children. Each child will have an opportunity to practice each of the strategies with another child, with the different activities.

Good bye:

1. ECE will ask Child 2 to give out the hands using peers names. ECE and interventionist will sing “good bye song” emphasizing each child’s name, while singing, and encouraging all the children to sing along.

2. The interventionist will thank the children for participating in the group, and remind them that they will meet again the next day.

3. Each child will receive a reward stamp on his/her hand.

Session 5.

Introduction:

1. The ECE will ask the three children (child with ASD and two peers) to join her and the interventionist in the designated “quiet space” in the child care center using the appropriate script (Table 8).

2. Children will be seated in a semi-circle, facing the ECE and the interventionist.

3. The ECE will ask Child 3 (child with ASD) to give each other child a “hand” cut-out with his/her name written on it, and will be encourage the child to say: “Here, Jimmy. Take the hand.”
4. The ECE and the interventionist will sing the “Good Morning” song, using the hand cut-outs, encouraging all the children to sing and emphasizing each child’s name while singing.

5. Child 3 will collect hand cut-outs and return them to interventionist.

Review and practice:

1. The ECE will review the strategies depicted on both Social Skills Picture Boards (Figure 2, Figure 3).

2. The interventionist and the children will then play a matching game with the Social Skills Picture Boards and the 10 individual picture prompt cards: all three children will take turns to pick an individual picture prompt card, name the strategy depicted, and then match it to the corresponding strategy on the picture board.

3. The ECE will then lead the children in practicing the strategies depicted on the cards with someone who is uncooperative: the individual picture prompt cards will be rearranged face down in a pile in the centre of the circle and each child will, in turn, pick a card and use the strategy depicted with the ECE, who will assume the role of an uncooperative peer. The ECE will either ignore the child’s request to play or saying “No!”. The interventionist will help the children think of ways to persuade the ECE to engage in the play activity (e.g., ‘Try again” or “try something else”) and will encourage the children to practice these strategies.

Good bye:

1. The ECE will ask Child 3 to give out the hands using peers names. ECE and interventionist will sing “good bye song” emphasizing each child’s name, while singing, and encouraging all the children to sing along.
2. The interventionist will thank the children for participating in the group, and will remind them that this was the last group session and that they have done a wonderful job.

3. The interventionist will remind them of specific strategies that they learnt and practiced, and will tell the children that they will have the opportunity to practise playing together, just like Franklin and Moose, in the following weeks.

4. Each child will receive a reward stamp on his/her hand.

5. Each child will also receive a certificate of participation, and a copy of the book “Franklin’s New Friend”.

Implementation Phase

The objective of the implementation phase is to allow the children an opportunity to apply the social interaction skills that they have learned in the social skills training sessions. During this phase, each child with ASD will participate in implementation sessions with one of his/her typically-developing peer interventionists three times a week for four weeks (i.e., twelve times in total), equaling six times with each peer. Each session will involve the child with ASD, and one of his/her two typically developing peers, the ECE, and the interventionist. The first typically developing peer to participate in an implementation session will be chosen randomly. The peers will then alternate.

Setting and materials. The implementation sessions will take place in the classroom, at a time when other children are in the playground or in a different room in the childcare centre. Children will be directed to two consecutive play contexts, playdough and block play, for a total of 20 minutes: 10 minutes with playdough and 10 minutes with block play. The first context for the first session will be chosen randomly, and the first contexts for subsequent sessions will
alternate. For the playdough context the children will be seated together at a child-sized table and materials will consist of two 5-ounce cans of playdough in primary colours, utensils to use with the playdough, i.e., a rolling pin, a plastic knife and fork, a set of measuring spoons, a pizza-cutter, two plastic plates, five molds, and four plastic cup-cakes. For block play the children will play on the carpet in the playroom and materials will consist of a large bag of Mega Bloks© containing 80 interlocking building blocks in bright primary colors and Mega Blok© figures from a castle set (king, queen, dragon, ghost, and knight) and from a farm set (farmer, boy, girl, chicken, and cow). For all implementation sessions, materials will also include the two Social Skills Picture Boards (Figure 2, Figure 3) and the 10 individual 9cm x 9cm prompt cards. The Social Skills Picture Boards will be placed in view at each activity area to remind the children of the strategies they have learnt.

*Implementation sessions.* The format for each of these implementation sessions will be as follows:

1. The ECE will invite the child with ASD and the designated peer to the playroom for the implementation session saying: “Do you remember what we talked about last time, with Franklin and Moose? How Franklin was Moose’s buddy? And how Franklin showed Moose how to play together? Today I want you to be “buddies” and to play together. Olga, today it is your turn to get Lily to play with you. Can you go to the table with Lily, and see if you can be her buddy? See if you can get her to play with you.” (Table 8).

2. The ECE and the two children will review the strategies learnt in the social skills training sessions. To facilitate this review, the ECE will place the 10 individual picture strategy cards in a pile on the table, together with the two Social Skills Picture Boards (Figure 2, Figure
3). The children will take turns picking a card, describing the strategy, and matching it to the corresponding strategy on the Picture Board.

3. The ECE will remind the child with ASD and the peer interventionist how they had utilized the strategies successfully to facilitate social interactions on previous occasions (either during the social skills training session or during the previous implementation session), saying: “Remember how you asked Lily to come and play with you last week? You tapped her on the shoulder and gave her a toy, and asked her to come play.”.

4. The ECE will direct the children to the blocks and then the playdough (or vice versa, according to schedule) saying: “Now it is your turn to play together at the ….”

5. If either of the children wanders away from the activity, the ECE will ask them to return to the play area. If either of the children refuses to participate in the play session, the session will be stopped and an extra session will be scheduled.

6. The ECE will be responsible for providing prompts (Table 9) during the implementation sessions as follows: if, during any of the sessions, there is a period of 30 seconds with no interaction, the ECE will intervene and reminded the peer interventionist of the strategies he/she can use to engage the child with ASD. For example, the ECE can say: “Jonny, I see Paul is not playing with you. What can you say to him?”

6. The ECE will also be responsible for providing praise (Table 9) during the implementation sessions. During the first three implementation sessions, the ECE will praise the children each time a social interaction strategy was used (e.g., “Good playing, Carmen, I see you are tapping Joey on the shoulder”). The ECE will fade the feedback to once every two minutes during the subsequent sessions.

7. At the end of each session, each child will receive specific positive feedback from
the early childhood educator (e.g., “I like the way you called Lily to come and play with you. You played together really well today!”). Each child will also receive a reward stamp on his/her hand.

8. All implementation sessions will be videotaped.

9. After each implementation session the interventionist will meet with the ECE for five to ten minutes to review the strategies that the children used during the session, the praises and prompts that were provided, and to discuss the strategies that need to be reinforced, and the feedback that the children ought to receive at the next session.

Follow-up and support meetings

Following the implementation phase, a break of several weeks will be introduced, during which the interventionist will not visit the childcare centre. During this period the ECE will continue to follow the schedule used during the implementation phase. That is, the ECE will pair the child with ASD with a trained typically developing peer for specific 20 minute play times three times a week. During this period the interventionist will have weekly telephone meetings (in total 4 telephone meetings) with the ECE, in order to answer questions and provide support for the continuation of the intervention.
### Table C1

**Materials, Settings and Participants for the Early Childhood Educator Training, the Phases of the Intervention, and the Phases of the Data Collection**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Setting</th>
<th>Materials</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early childhood educator (ECE) training meetings</td>
<td>Staff room in childcare centre</td>
<td>Intervention manual Book: Franklin’s New Friend Social skills picture boards Social skills picture cards</td>
<td>ECE Interventionist</td>
</tr>
<tr>
<td>Data collection: Baseline sessions</td>
<td>Preschool room in childcare centre</td>
<td>Panasonic digital camcorder Playdough Megablocks©</td>
<td>Child with ASD One typically developing peer ECE Videographer</td>
</tr>
<tr>
<td>Intervention: Social skills training sessions</td>
<td>Preschool room in childcare centre</td>
<td>Book: “Franklin’s New Friend”, Bourgeois, 1997 Social skills picture boards Social skills picture cards Franklin and Moose puppets Blocks, cars puzzle</td>
<td>Child with ASD Two typically developing peers ECE Interventionist</td>
</tr>
<tr>
<td>Intervention/data collection: Implementation sessions</td>
<td>Preschool room in childcare centre</td>
<td>Panasonic digital camcorder Social skills picture boards Social skills picture cards Playdough Megablocks©</td>
<td>Child with ASD One typically developing peer ECE Videographer</td>
</tr>
<tr>
<td>Intervention: Follow-up and support meetings</td>
<td>Telephone conversations with ECE</td>
<td>None</td>
<td>ECE Interventionist</td>
</tr>
<tr>
<td>Data collection: maintenance and generalization sessions</td>
<td>Preschool room in childcare centre</td>
<td>Panasonic digital camcorder Social skills picture boards Social skills picture cards Playdough Megablocks©</td>
<td>Child with ASD One typically developing peer ECE Videographer</td>
</tr>
</tbody>
</table>
### Table C2

*Modifications to “Franklin’s New Friend” (Paulette Bourgeois, 1997)*

<table>
<thead>
<tr>
<th>Page #</th>
<th>Statement</th>
<th>Change/Add/Ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Franklin was so scared that he raced home</td>
<td>How did Franklin feel? He was sooooo ……</td>
</tr>
<tr>
<td>7</td>
<td>“I expect you to be nice when you meet someone new”</td>
<td>What did mom say? I expect you ………</td>
</tr>
<tr>
<td>9</td>
<td>“Hello Moose”</td>
<td>What did they say to Moose? They said ………</td>
</tr>
<tr>
<td>11</td>
<td>I’d like you to be a buddy for Moose”</td>
<td>What did Mr Owl say? I’d like you to be ……..”</td>
</tr>
<tr>
<td>12</td>
<td>“Do you want to play?</td>
<td>What did Franklin say? Do you ……… And what did Moose say? (Shake head as prompt)</td>
</tr>
<tr>
<td>14</td>
<td>During recess, Moose stood alone. Franklin and his friends played soccer.</td>
<td>Moose stood all alone. He was sad. Franklin and his friends played soccer. And, look what happened! (show picture). What will they do? Who can help? (prompt by pointing at Moose getting ball down).</td>
</tr>
<tr>
<td>19</td>
<td>Do you want to help me Moose?</td>
<td>What did Franklin say, he said: Do you want…… And what do you think Moose said? (prompt by nodding).</td>
</tr>
<tr>
<td>21</td>
<td>They both liked to build structures.</td>
<td>“My turn, moose. Now its your turn!. What did Franklin say? He said My…..</td>
</tr>
<tr>
<td>23</td>
<td>At lunch….buddy</td>
<td>Franklin said, Moose, …….</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>25</td>
<td>I have a new friend</td>
<td>What did Franklin tell mom? He said, I have…..</td>
</tr>
<tr>
<td></td>
<td>What is he like?</td>
<td>Prompt with gestures – “Moose is big, but he’s not scary”</td>
</tr>
<tr>
<td>26</td>
<td>“I’m glad you were my buddy”</td>
<td>What did Moose say? He said, Thank you! I’m……</td>
</tr>
</tbody>
</table>
### Table C3

*Invitation Scripts for ECEs*

<table>
<thead>
<tr>
<th>Session</th>
<th>Subject</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Child with ASD</td>
<td>“This is Esther, and she wants you to help her. She is videotaping children who are playing together and she wants you to play together, first in the block area and then at the playdo table. J (typical child), can you get Lily (child with ASD) to play with you with the blocks? If you don’t want to, just tell me. I won’t be angry at all. But if you want to help, go, ask Lily to come and play. See if you can get her to play with you.”</td>
</tr>
<tr>
<td>Social skills training</td>
<td>Child with ASD</td>
<td>“Children this is Esther. You remember, Esther was here last week, to videotape when you played together. Esther needs your help. She is doing a study, and she wants you to be part of it. Every day this week Esther and I are going to do activities in the library (or a different quiet space). We are going to sing, to read a story and to play, with just the three of you. Would you like to take part in these activities? And then next week, Esther will be back to videotape you again. She will ask you to play with Lily at different activities, just like you did last week (during baseline). If you don’t want to, just tell me. You can stay with the rest of the class. But if you want to help, just come with us.”</td>
</tr>
</tbody>
</table>
### Implementation

<table>
<thead>
<tr>
<th>Child with ASD</th>
<th>1 td peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Do you remember what we talked about last week, with Franklin and Moose? How Franklin was Moose’s buddy? And how he showed him how to play together? Today I want you to be “buddies” and to play together. Paul, (td peer) remember what Franklin did to get Moose to play with him? (Show children prompt page). He said………, he gave him a toy, he asked for help (the ECE will encourage the typically developing child to label the prompt pictures). Today it is your turn to get Lily to play with you. Can you go to the block table with Lily, and see if you can be her buddy. See if you can get her to play with you.”</td>
<td></td>
</tr>
</tbody>
</table>

### Maintenance and Generalization

<table>
<thead>
<tr>
<th>Child with ASD</th>
<th>1 td peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>“J and Lily, today it is your turn to be buddies. Go to the block table and play together. Remember how Franklin and Moose played together? Now it is your turn to play together again.”</td>
<td></td>
</tr>
</tbody>
</table>

### All sessions

<table>
<thead>
<tr>
<th>Any child unwilling to participate</th>
</tr>
</thead>
<tbody>
<tr>
<td>If any child demonstrates unwillingness to participate in the program, he/she will return to the main group of children without any effect on their participation in the regular childcare program. On the next occasion, the child will be invited again to “be a buddy”. If a child refuses 3 times he/she will not participate in the research project.</td>
</tr>
</tbody>
</table>

**Note:** Child with ASD= child diagnosed with Autism Spectrum Disorder; td peer = typically-developing peer.
Table C4

*Protocol and Scripts for Prompts and Praise*

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prompt</strong></td>
<td>If there is a period of 30 seconds with no interaction(^1)</td>
<td>The ECE will remind the peer interventionists of the strategies they could use to engage the child with ASD. For example, “Jonny, I see Jacob is not playing with you. What can you say to him? Remember what you can do, you can say “please help”!”</td>
</tr>
<tr>
<td><strong>Praise</strong></td>
<td>During the first three implementation sessions – each time a child uses a strategy to initiate or maintain interaction</td>
<td>The ECE will praise the child for using a specific strategy. For example, “Well done, Claire, you tapped Joey on the shoulder!”</td>
</tr>
<tr>
<td><strong>Praise</strong></td>
<td>During the last three implementation sessions – praise will be faded to once every two minutes</td>
<td>The ECE will praise the child for using a specific strategy. For example, “Well done, Claire, you told Jacob it was his turn!”</td>
</tr>
<tr>
<td><strong>Praise/positive feedback</strong></td>
<td>At the end of each implementation session</td>
<td>The ECE will give both children specific positive feedback. For example, “I like the way you called Lily to come and play with you.”</td>
</tr>
</tbody>
</table>

\(^1\) In order to ascertain how much time elapses between interactions, the interventionist will monitor the digital clock on the video camera while videotaping the children and will signal the ECE as necessary.
<table>
<thead>
<tr>
<th>Session</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interventionist will read story with emphasis on utterances pertaining to feelings and strategies.  Early childhood educator and interventionist will role play with puppets. Early childhood educator will summarize story, talking about Franklin’s friendly overtures.</td>
</tr>
<tr>
<td>2</td>
<td>Interventionist will read story. Children will be encouraged to repeat highlighted scripts with support from early childhood educator. Early childhood educator, interventionist and children will “act” the story together, with appropriate puppets. Interventionist will record joint activities that children suggest on flip chart. Early childhood educator will review and discuss activities.</td>
</tr>
<tr>
<td>3</td>
<td>Children will tell the Franklin story, using the pictures in the book as prompts and adopting the speaking voice of the puppets/characters. Interventionist will introduce Social Skills Picture Board 1 with pictures of strategies to initiate interactions. Early childhood educator will practice strategies with each child.</td>
</tr>
<tr>
<td>4</td>
<td>Interventionist will review initiation strategies. Interventionist will introduce Social Skills Picture Board 2 with pictures of strategies to maintain interactions. Early childhood educator will practice strategies with each child using toys as props.</td>
</tr>
<tr>
<td>5</td>
<td>Early childhood educator will review initiation and maintenance strategies. Children will play matching game with cards to depict each strategy. Children will practice using strategies with early childhood educator as an uncooperative peer.</td>
</tr>
</tbody>
</table>
Table C6

*Checklist for Social Skills Training Sessions*

**Session #1.**

Date: ________________________________

Name of Child with ASD: __________________

ECE: __________________________________

***Completed during session:***

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of script to invite children to session.</td>
</tr>
<tr>
<td>2</td>
<td>Introductory song with “hand”.</td>
</tr>
<tr>
<td>3</td>
<td>Read “Franklin”.</td>
</tr>
<tr>
<td>4</td>
<td>Give children puppets, read Franklin with modifications.</td>
</tr>
<tr>
<td>5</td>
<td>Talk about <em>feelings</em> of characters.</td>
</tr>
<tr>
<td>6</td>
<td>Talk about <em>actions</em> characters took.</td>
</tr>
<tr>
<td>7</td>
<td>Conversation about how Franklin and his classmates became friends with Moose.</td>
</tr>
<tr>
<td>8</td>
<td>Good-bye song with “hand”.</td>
</tr>
<tr>
<td>9</td>
<td>Praise to each participating child.</td>
</tr>
</tbody>
</table>
Session #2.

Date: ________________________________

Name of Child with ASD: ________________________

ECE: _______________________________________

Completed during session:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of script to invite children to session.</td>
</tr>
<tr>
<td>2</td>
<td>Introductory song with “hand”.</td>
</tr>
<tr>
<td>3</td>
<td>Gave children puppets, read Franklin with modifications.</td>
</tr>
<tr>
<td>4</td>
<td>Encouraged children to participate in storytelling using voice of puppet they are holding.</td>
</tr>
<tr>
<td>5</td>
<td>Encouraged children to talk about how their puppet <em>feels</em>.</td>
</tr>
<tr>
<td>6</td>
<td>Encouraged children to talk about what their puppet <em>does</em>.</td>
</tr>
<tr>
<td>7</td>
<td>Asked children to suggest activities characters could do together.</td>
</tr>
<tr>
<td>8</td>
<td>Good-bye song with “hand”.</td>
</tr>
<tr>
<td>9</td>
<td>Praise to each participating child.</td>
</tr>
</tbody>
</table>
**Session #3.**

Date: __________________________________________

Name of Child with ASD: _______________________

**ECE:** _______________________________________

Completed during session:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of script to invite children to session.</td>
</tr>
<tr>
<td>2</td>
<td>Introductory song with “hand”.</td>
</tr>
<tr>
<td>3</td>
<td>Children retold Franklin story prompted by illustrations in book.</td>
</tr>
<tr>
<td>4</td>
<td>Introduced Social Skills Picture Board #1</td>
</tr>
</tbody>
</table>
| 5 | Role play of each strategy depicted on board with puppets.  
  - I want to play  
  - Please help  
  - Come play  
  - Give a toy  
  - Tap the shoulder |
| 6 | Good-bye song with “hand”. |
| 7 | Praise to each participating child. |
**Session #4.**

Date: _______________________________________

Name of Child with ASD: _______________________

ECE: _______________________________________

Completed during session:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of script to invite children to session.</td>
</tr>
<tr>
<td>2</td>
<td>Introductory song with “hand”.</td>
</tr>
<tr>
<td>3</td>
<td>Reviewed strategies on Social Skills Picture Board #1.</td>
</tr>
<tr>
<td>4</td>
<td>Introduced Social Skills Picture Board #2.</td>
</tr>
</tbody>
</table>
| 5 | Role play of each strategy depicted on board with puppets.  
  - Let’s play more  
  - Good job  
  - My turn/your turn  
  - Do it again  
  - I like that |
| 6 | Practiced play with cars, blocks, puzzle, using each of the 10 strategies learned:  
  - I want to play  
  - Please help  
  - Come play  
  - Give a toy  
  - Tap the shoulder  
  - Let’s play more  
  - Good job  
  - My turn/your turn  
  - Do it again  
  - I like that |
| 7 | Good-bye song with “hand”. |
| 8 | Praise to each participating child. |
Session #5.

Date: _______________________________________

Name of Child with ASD: ________________________

ECE: _________________________________________

Completed during session:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of script to invite children to session.</td>
</tr>
<tr>
<td>2</td>
<td>Introductory song with “hand”.</td>
</tr>
<tr>
<td>3</td>
<td>Reviewed all the strategies, playing a matching game.</td>
</tr>
<tr>
<td>4</td>
<td>Used each strategies with cars, blocks, puzzle with the ECE acting as uncooperative peer.</td>
</tr>
<tr>
<td></td>
<td>• I want to play</td>
</tr>
<tr>
<td></td>
<td>• Please help</td>
</tr>
<tr>
<td></td>
<td>• Come play</td>
</tr>
<tr>
<td></td>
<td>• Give a toy</td>
</tr>
<tr>
<td></td>
<td>• Tap the shoulder</td>
</tr>
<tr>
<td></td>
<td>• Let’s play more</td>
</tr>
<tr>
<td></td>
<td>• Good job</td>
</tr>
<tr>
<td></td>
<td>• My turn/your turn</td>
</tr>
<tr>
<td></td>
<td>• Do it again</td>
</tr>
<tr>
<td></td>
<td>• I like that</td>
</tr>
<tr>
<td>5</td>
<td>Gave children books and certificate of friendship.</td>
</tr>
<tr>
<td>6</td>
<td>Good-bye song with “hand”.</td>
</tr>
<tr>
<td>7</td>
<td>Praise to each participating child.</td>
</tr>
</tbody>
</table>
Appendix D

Child Intervention Code¹

Child Initiations:

These behaviors start an interaction and are not preceded by another child's behavior during the previous 6-second interval. Five types of child initiations will be scored, including:

- **Play organizer:** Verbal or non-verbal invitations to play, wherein a child specifies an activity, suggests a play idea, or directs another child to engage in an activity-related play behavior.
- **Share:** Verbal or non-verbal offer of an object to, or request for an object from another child.
- **Assistance:** Verbal or non-verbal offer or request for help.
- **General:** All verbal or social initiations not scored in the other categories.
- **Negatives:** All verbal or physical actions that are uncomplimentary, rejecting, or physically harmful in nature.

Observers will score a maximum of one initiation per observational interval. Two precedence rules exist for intervals during which two or more initiations occur. First, negatives will take priority over all other types of initiations. Second, shares, play organizer, and assists will take precedence over general initiations.

Child Responses:

These behaviors are timely and direct responses to another child's initiation (i.e., they occur within two observational intervals after the initiation). Five different responses can be scored:

¹Modified from


Peer-mediated intervention

- **Negatives:** All verbal or physical actions that are uncomplimentary, rejecting, or physically harmful in nature.

- **Onlooker:** Child glances at/ looks at peer briefly.

- **Sustained Gaze:** Target child focuses visually on object that peer is involved with.

- **Passive Joint:** Target child and peer are actively involved with an object of focus or activity.

- **Coordinated Joint:** Target child is actively involved with and coordinates his/her attention to both the peer and the object that the peer is involved with.

Non Interactive:

- No evidence of sustained engagement with peer or with object that peer is playing with. Child may be unoccupied, visually scanning environment or self-involved in motor activity to the exclusion of the peer.

Proximity to task:

- Lack of proximity to task is recorded when the child is out of the range of the video camera, which is trained on the planned activity area.
Scoring Form for Child Intervention Code

Date: ________
Target Child: (light) ____________
Peer: dark) ____________

<table>
<thead>
<tr>
<th>NON INTERACTIVE</th>
<th>INITIATIONS</th>
<th>RESPONSES</th>
<th>PROMPT / PRAISE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unitary</td>
<td>Onlooker</td>
<td>unitary - verb</td>
</tr>
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</table>

Peer TOT

Target TOT
Appendix E

*Interrater Reliability Scores*

<table>
<thead>
<tr>
<th>Codes</th>
<th>Lily</th>
<th>Jacob</th>
<th>Joey</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td><strong>Initiations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>59/71</td>
<td>66/78</td>
<td>74/86</td>
<td>199/235</td>
</tr>
<tr>
<td><strong>Responses</strong></td>
<td>335/371</td>
<td>159/186</td>
<td>359/397</td>
<td>853/954</td>
</tr>
<tr>
<td><strong>Non-interaction</strong></td>
<td>448/492</td>
<td>740/773</td>
<td>420/460</td>
<td>1608/1725</td>
</tr>
<tr>
<td><strong>Extended interactive engagement</strong></td>
<td>29/32</td>
<td>64/64</td>
<td>52/57</td>
<td>145/153</td>
</tr>
<tr>
<td><strong>Average length of extended interactions</strong></td>
<td>24/30</td>
<td>56/64</td>
<td>36/45</td>
<td>116/139</td>
</tr>
</tbody>
</table>
Appendix F

Early Childhood Educator Evaluation

Early Childhood Educator’s Name:________________________________________
Child Care Centre:_____________________________________________________
Date: _______________________

Please rate the following statements regarding feasibility and success of social intervention teaching strategies on a scale of 1 – 5:

1. I am able to teach peers ways to communicate with children with ASD in my classroom.

   1  2  3  4  5
   not at all feasible  feasible to use some of the time  feasible to use nearly all the time

If you have chosen between 1- 3, please list some reasons why
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

2. I am able to prompt peers to communicate with children with ASD in my classroom.

   1  2  3  4  5
   not at all feasible  feasible to use some of the time  feasible to use nearly all the time

If you have chosen between 1- 3, please list some reasons why
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

3. I am able to praise peers for communicating with children with ASD in my classroom.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

If you have chosen between 1- 3, please list some reasons why

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

4. I will be able to continue implementing this social intervention, independently, in my classroom.

If you have chosen between 1- 3, please list some reasons why

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

5. The target child benefited from the intervention.

Please explain

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________
6. The typically developing peers benefited from the intervention.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td>some benefit was noted</td>
<td>benefited a lot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please explain

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

7. I would use this intervention again.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td>maybe</td>
<td>definitely</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have chosen between 1-3, please list some reasons why
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
Independent Observer Evaluation

Name: ______________________

Child’s name: ________________

Date: ______________________

Please rate the following statements regarding the interactions of the target child on a scale of 1 – 5:

1. This child interacts well with peers

   1 2 3 4 5
   not at all normal for age very often

2. This child initiates cooperative play

   1 2 3 4 5
   not at all normal for age very often

3. This child responds to play invitations

   1 2 3 4 5
   not at all normal for age very often

4. This child shares play materials

   1 2 3 4 5
   not at all normal for age very often

5. This child takes turns while playing

   1 2 3 4 5
   not at all normal for age very often

6. This child engages in extended interactions

   1 2 3 4 5
   not at all normal for age very often
A series of six nonparametric Wilcoxon Signed Ranks tests was conducted to examine the ratings for each item of the rating scale. The analyses compared the ratings between the baseline and maintenance sessions.

The results indicated that the ratings for the maintenance video clips were significantly higher than the ratings for the baseline video clips, \( Z_s = -3.33 \text{ to } -3.47, \ p_s = .001 \). This confirms that the independent observers gave significantly different ratings to the randomized video clips of peer interaction.
Appendix G

Transcripts of 2 minute Video Clips of Children’s Interactions during Baseline and Maintenance Sessions

Lily with Peer 1- Baseline

Parallel play
Lily – playing silently throughout
Peer 1 – it has to be in (to no-one in particular)

Look at my pam-pam (to no-one in particular)
Can you see this? (to interventionist)
Lily – looked up briefly at Peer 1
Peer 1 - Wait .. wait… wait (to no-one in particular)

Lily with Peer 1- Maintenance

Cooperative play
Lily – oh do it
Peer 1 - help, king. King, where are you?
Lily - here, I got it
Peer 1 - no, say “what”. “What!”
Lily - What!
Peer 1 - I was up the stairs and it fell off. Help me
Lily - Okay, I help
Peer 1 – Help king, I’m going to die
Lily - What the king did?
Peer 1- and he go “oooh” (reaching over to Lily’s toy princess)
Lily - not her! Not her hand
**Peer-mediated intervention**

*Jacob with Peer 1- Baseline*

Each child playing on his/her own

Jacob - ohh (to no-one in particular)

Peer 1 - hey, what is this? (to no-one in particular)

Singing to herself

There have to be two houses! (to interventionist)

Jacob - Eh….. (building with blocks on his own).

*Jacob with Peer 1- Maintenance*

Cooperative play – taking turns adding blocks to tower

Peer 1 - I need these

Jacob - No!

Peer 1 - Put them there

Jacob - one,

Peer 1 - two, my turn

Jacob - three, four

Peer 1 - YAY!

Jacob - and five

Peer 1 – and thirteen

Jacob - six

Peer 1- no, seventeen and eighteen

Jacob - nine…. 

Peer 1 - nineteen

Laughter, tower falling down

Jacob - oh-oh
Peer-mediated intervention

*Joey with Peer 1 - Baseline*

Each child playing on his own

Joey - talking to himself – That goes over here

That goes in the middle

Peer 1 - talking to himself - There

There you go

Joey - talking to himself - There, now I take these

And this is here

And this stays here

Peer 1 - talking to himself - I’m gonna do this

*Joey with Peer 1 - Maintenance*

Cooperative play – taking turns, building together

Joey - That goes in the middle

Peer 1 - no, where is it?

Joey - it goes here (pointing), I know, the girl, it is there

Peer 1 – oh, there it is

They gonna sit together

Joey - they have to go here

Peer 1 - they sitting together

Joey - no, they have to go up here, from one over here and she over here

Peer 1 - they’re guys

Who’s got the guys? Oh, here’s the guys

Joey - the dragon is going with the girls?

Peer 1 - the dragon is catching them
Joey - you sure? You must be sure that’s why they are going in

Next is that part, then you put this here

Peer 1 - the dragon goes here

Joey - is that a bad dragon?

Peer 1 – no, he’s a good dragon

Ha-ha, that’s funny

Hey, where should I put this?

Joey - it’s over here

Peer 1 - (pretend choking)

The guy…. chkkkk …. a rope

Joey - he’s a weird guy

He’s a cowboy

Peer 1 - oh no – the cow is falling down