PROMOTING SOCIO-COMMUNICATIVE DEVELOPMENT IN STUDENTS WITH AUTISM WHO USE AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

by

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ABSTRACT

Supporting social interactions between children with autism spectrum disorders (ASD) who use augmentative and alternative communication (AAC) and their typically developing peers presents many challenges. The purpose of the study was to investigate the effects of a peer-mediated intervention designed to teach two students with ASD to use speech-generating devices (SGDs) to engage in interactions with peers in a social context at school. Six typically developing peers (three from each participant’s inclusive classroom) were taught to support SGD use by their classmates with ASD during game activities. A multiple baseline design was used to examine the relationship between peer-mediated instruction and an increase in total communicative acts by the two participants. Although a functional relationship was not established unequivocally, the results suggest that the intervention was effective at increasing total CAs. These results failed to generalize to non-experimental social settings, but social validity ratings by all of the confederates were positive. Results are discussed regarding educational implications, limitations, and future research.
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CHAPTER 1: Introduction

Pervasive Developmental Disorders

Pervasive Developmental Disorder (PDD), as defined in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (text revision) (DSM-IV-TR; American Psychiatric Association, 2000), includes five childhood disorders: Rett’s syndrome, Autistic Disorder, Asperger’s syndrome, Childhood Disintegrative Disorder and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). Also referred to as “autism spectrum disorders” (ASDs), the PDDs share similar characteristics, including impaired social interaction; impaired language and communication; and restricted, repetitive, and stereotyped patterns of behavior, interests, and activities. ASD can be comorbid with mental retardation, epilepsy (Canitano, 2007), fragile X syndrome, tuberous sclerosis, Down Syndrome, and various other genetic syndromes (Zafeiriou, Ververi, & Vargiami, 2007).

The overall prevalence of ASD is estimated at 58.7 per 10,000 live births (Chakrabarti & Fombonne, 2005). Due to the heterogeneity of the disorder, severity of symptoms can differ among individuals; hence, the average age of diagnosis is approximately 3 years of age (Chakrabarti & Fombonne, 2005). Although the exact cause of the disorder is unknown, research suggests strong evidence that underlying genetic components combined with various environmental factors may be responsible (Zafeiriou et al., 2007).

Autistic Disorder

Autistic Disorder (more commonly referred to as simply “autism”) is the second most prevalent PDD, with an incidence of 22 per 10,000 live births (Chakrabarti & Fombonne, 2005). Males are 4-5 times more likely than females to be diagnosed with the autism;
however, females tend to be more severely affected by the disorder (Fombonne, 2005). An individual must meet the following DSM-IV-TR criteria to be diagnosed with Autistic Disorder:

A. A total of six or more items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):

(1) Qualitative impairments in social interaction, as manifested by at least two of the following:
   a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
   b. failure to develop peer relationships appropriate to developmental level
   c. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
   d. lack of social or emotional reciprocity

(2) Qualitative impairments in communication as manifested by at least one of the following:
   a. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
   b. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
   c. stereotyped and repetitive use of language or idiosyncratic language
d. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

(3) Restricted, repetitive, and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

a. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus

b. apparently inflexible adherence to specific, nonfunctional routines or rituals

c. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)

d. persistent preoccupation with parts of objects

(4) Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

(5) The disturbance is not better accounted for by Rett’s Disorder or Childhood Disintegrative Disorder.

**Difficulty with Communication**

It is estimated that one third to one half of children with ASD never develop functional speech (National Research Council, 2001). In his seminal paper entitled, “Autistic Disturbances of Affective Contact,” Kanner (1943) described 11 children with autism, 8 of whom eventually acquired some form of speech. Although verbal expression was evident in these children, it was characterized by echolalia (i.e., repetitive speech), an absence of spontaneous sentence formation, monotone intonations, and language use that was quite
literal. Language impairments have also been noted in the areas of semantics (i.e., word meaning) and pragmatics (i.e., social use) of language (Ogletree & Harn, 2001).

The deficits associated with speech and language often create challenges in the structure, content, and use of language in social communication exchanges (Light, Roberts, DiMarco, & Greiner, 1998). Children with ASD who lack speech altogether or whose speech is significantly delayed often rely on prelinguistic forms of communication such as reaching, pointing, or guiding another person’s hand toward a desired item (Sigafosos et al., 2004). Though these basic forms of communication may be effective for obtaining desired items or activities in the immediate environment, children with ASD must develop the receptive and expressive language skills that are necessary for more broad-based functional communication and for participation as both listeners and speakers during conversational exchanges (Sevcik & Romski, 2002). When these skills fail to develop naturally, augmentative and alternative communication (AAC) interventions are often required.

**Augmentative and Alternative Communication (AAC)**

AAC is one of the most widely established forms of intervention for children with ASD who do not develop functional speech. AAC can be defined as “attempts to study and when necessary compensate for temporary or permanent impairments, activity limitations, and participation restrictions of persons with severe disorders of speech-language production and/or comprehension, including spoken and written models of communication” (ASHA, 2004, p. 1). Two types of AAC exist: unaided communication and aided communication. Unaided communication does not involve any device external to ones body and includes manual signs and gestures (Mirenda, 2003). Aided communication includes equipment
external to ones body such as picture communication symbols, non-electronic communication boards and speech-generating devices (SGDs) (Mirenda, 2003).

A variety of aided and unaided AAC methods have been applied to individuals with ASD to address core impairments in communication. Lexigrams, manual signs, and orthographic symbols (i.e., writing) were preferred methods for augmenting communication in individuals with ASD in the 1970s. During the 1980s, photographs, line drawings, and other types of graphic symbols were more commonly used. The advancement of technology introduced SGDs and computer software programs in the early 1990s. Over the past three decades, a wide range of AAC techniques have been used effectively to facilitate expressive and receptive language development, and to reduce problem behaviors through functional communication training (FCT) in children with ASD (Mirenda & Erickson, 2000).

Although a body of research supporting both unaided and aided forms of AAC exists, aided communication may be more suitable for many individuals with ASD, who often present with fine motor difficulties that limit the type and form of AAC that can be successfully applied. In Kanner’s (1943) description of individuals with autism, they were described as being “skillful” in terms of their fine motor coordination (pp. 248); however, recent studies suggest evidence to the contrary. The National Research Council (2001) suggested that children with ASD have specific impairments in motor imitation, coordination, and finger-to-thumb opposition. A study by Seal and Bonvillian (1997) found that manual sign production in individuals with ASD was significantly correlated with indices of motor functioning. The authors analyzed 14 students diagnosed with ASD in terms of their sign location, hand shape, and movement production. Results indicated that both accuracy of sign formation and vocabulary size were correlated with measures of apraxia and
fine motor age scores, suggesting that fine motor difficulties may impede acquisition of unaided forms of AAC such as manual signing (Seal & Bonvillian, 1997). Furthermore, the responses required by aided AAC techniques (i.e., pointing and/or reaching) demands less physical effort than do unaided techniques such as manual signs.

Further arguments for aided AAC pertain to functional use in a wide variety of environments. Mirenda (2003) noted that, “in order for communication to be truly functional, it must be easily understood by both familiar and unfamiliar partners” (p. 207). AAC methods such as manual signs and gestures can be ambiguous and are often misunderstood by communicative partners. Research by Rotholz, Berkowitz, and Burberry (1989) demonstrated that, when two individuals with autism were taught to order food in a restaurant using both manual signs and Picture Communication Symbols (PCS), only the PCS requests were successfully understood by unfamiliar waitpersons. Since most natural speakers do not understand sign language, more intelligible forms of aided communication such as PCS accompanied by written text or SGD with voice output may be preferable for functional use (Mirenda 2003).

**Speech-generating devices (SGDs).** SGD are programmable, digital devices that provide voice output in the form of digitized or synthesized speech when activated (Mirenda 2003). Graphic symbols with or without text, each corresponding to a letter, word and/or phrase, are placed on an SGD display. When activated, the SGD produces speech output that is either digitized or synthetic. Digitized speech is produced by a human voice that is recorded and stored on the device. Since a human voice is used to record utterances, individual messages can differ in rate, intonation, pitch and loudness used to convey emotion and communicative function in natural speech (Schlosser, Sigafoos & Koul, 2009). Synthetic
speech is generated by a text-to-speech input system in which words or phrases are typed on
the device and converted into speech through a complex algorithm (Schlosser et al., 2009).
Although this form of output produces an infinite number of messages, it requires that its
user be literate, and is often described as “robotic” in quality (Schlosser et al., 2009).

SGDs have a number of advantages over graphic communication displays that do not
produce speech. In addition to providing information in the form of two modalities (both
visual and auditory), SDGs provide a precise, clear and more succinct form of
communication to natural speakers (Romski, Sevcik, & Adamson, 1999; Schlosser, et al.,
2009). SGDs can also be an efficient means for obtaining a communicative partner’s
attention, which indirectly creates additional opportunities for the user’s needs to be heard
and met (Romski & Sevcik, 1996). In addition, research has shown that auditory output
associated with SGDs has been particularly effective for graphic symbol learning in adults
with mental retardation (Schlosser, Belfiore, Nigam, Blischak, & Hetzroni, 1995) and
spelling acquisition in children with autism (Schlosser & Blischak, 2001).

A number of studies to date have examined the use of SGDs to enhance functional
communication with individuals with ASD. Most have relied on structured, adult-mediated
instructional strategies to teach functional requesting of items and/or activities. Table 1
summarizes the SGD research that has involved participants with ASD.
Table 1. Summary of literature using speech-generating devices as part of a treatment package in individuals with ASD

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<th>Settings</th>
<th>Instructional Techniques</th>
<th>Outcomes</th>
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<td>Dyches (1998)</td>
<td>To examine the effects of switch training on requesting</td>
<td>Alan, age 11; Nathan, age 10</td>
<td>• special education classroom</td>
<td>• Least-to-most prompts (verbal, partial model, full model, physical), time delay</td>
<td>• increased requesting for a drink (3/4 participants)</td>
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<tr>
<td>Schepis, Reid, Behrmann, &amp; Sutton (1998)</td>
<td>To evaluate the effects of an SGD on requesting/yes/no; and use of more, please, thank you, I’m finished/let’s do something else</td>
<td>Ben, age 5; Cory, age 5; Lynn, age 3; Ian, age 3</td>
<td>• classroom</td>
<td>• Naturalistic instruction, verbal/gestural prompts, least-to-most prompt hierarchy</td>
<td>• increased requesting and other interactions</td>
</tr>
<tr>
<td>Durand (1999)</td>
<td>To examine the effects of functional communication training with an SGD on requesting and reduction of problem behaviors</td>
<td>Ron, age 9; David, age 11</td>
<td>• classroom and community (magazine store for Ron and library for David)</td>
<td>• verbal and physical prompts, time delay</td>
<td>• increased unprompted use of SGD</td>
</tr>
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<td>Brady (2000)</td>
<td>To study the effects of SGD use during joint activity routines on requesting objects and object name comprehension</td>
<td>Amy, age 5</td>
<td>• small room adjoining the classroom</td>
<td>• verbal and physical prompts</td>
<td>• increased requests</td>
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<td></td>
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<td>• increased comprehension skills of object names</td>
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<td>Study</td>
<td>Purpose</td>
<td>Participants</td>
<td>Settings</td>
<td>Instructional Techniques</td>
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<tr>
<td>Sigafoos, Didden, &amp; O’Reilly (2003)</td>
<td>To study the effects of speech output vs. no speech output on the maintenance of requesting “I want more”</td>
<td>Michael, age 13; Jason, age 4</td>
<td>• outdoor dining area at school (Michael); outpatient clinic room in hospital (Jason)</td>
<td>• physical (least-to-most) prompts + verbal, time delay</td>
<td>• no differences in rate of requesting between the two conditions</td>
</tr>
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<td>Sigafoos, Drasgow, &amp; Schlosser (2004)</td>
<td>To teach communicative repairs using SGDs</td>
<td>Jason, age 16; Megan, age 20</td>
<td>• classroom (Jason) • school office (Megan)</td>
<td>• least-to-most physical prompts, time delay</td>
<td>• increased use of repairs following communicative breakdowns</td>
</tr>
<tr>
<td>Sigafoos, O’Reilly, Seely-York, &amp; Edrisinha (2004)</td>
<td>To evaluate the effects of a least-to-most prompting procedure for locating an SGD and make requests</td>
<td>Megan, age 20; Jason, age 16; Ryan, age 12</td>
<td>• classrooms during morning snack activity (Jason &amp; Ryan) • office during morning snack (Megan)</td>
<td>• verbal and physical prompts (least-to-most prompt hierarchy using gesture, gesture + verbal, physical), time delay</td>
<td>• increased ability to locate the SGD when needed to request objects</td>
</tr>
<tr>
<td>Sigafoos, O’Reilly, Ganz, Lancioni, &amp; Schlosser (2005) – Study 1</td>
<td>To determine preference for a particular model of SGD during acquisition of requesting “I want more”</td>
<td>Ryan, age 12</td>
<td>• classroom during snack</td>
<td>• least to most prompts (gesture, physical guidance), time delay</td>
<td>• demonstrated a consistent preference for a particular SGD</td>
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<tr>
<td>Study</td>
<td>Purpose</td>
<td>Participants</td>
<td>Settings</td>
<td>Instructional Techniques</td>
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<tr>
<td>Sigafos et al. (2005) – Study 2</td>
<td>To determine preference for SGD vs. picture exchange during acquisition of requesting</td>
<td>Ryan, age 12</td>
<td>• classroom during snack</td>
<td>• no prompting was used during this phase of the study</td>
<td>• demonstrated a preference for SGD as opposed to picture-exchange</td>
</tr>
<tr>
<td>Son, Sigafos, O’Reilly, &amp; Lancioni (2006)</td>
<td>To study the preference and requesting acquisition of a picture-exchange system vs. SGD</td>
<td>Kim, age 5; Lucy, age 3; Bruce, age 3</td>
<td>• kitchen of the family’s home</td>
<td>• least-to-most prompting (verbal, gesture, physical, time delay)</td>
<td>• increased requesting in both modalities • 2 children preferred picture exchange, 1 child preferred SGD</td>
</tr>
<tr>
<td>Olive et al. (2007)</td>
<td>To evaluate the effects of enhanced milieu teaching on requesting using an SGD</td>
<td>Mickey, age 4; Rocky, age 4; Terrence, age 5</td>
<td>• classroom</td>
<td>• Incidental/naturalistic teaching using most to least prompts</td>
<td>• increased requesting items during play</td>
</tr>
<tr>
<td>Schlosser et al. (2007)</td>
<td>To examine the effects of speech output vs. no speech output on requesting</td>
<td>Avery, age 9; Greg, age 8; Mathew, age 10; Michael, age 8; Zachary, age 10</td>
<td>• classroom</td>
<td>• errorless teaching, verbal and physical prompts</td>
<td>• increased requesting for 2 students with speech output, for 1 output, and for 2 with both speech and no speech</td>
</tr>
<tr>
<td>Study</td>
<td>Purpose</td>
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<td>Olive, Lang, &amp; Davis (2008)</td>
<td>To study the effects of FCT using an SGD on requesting and reduction of problem behavior</td>
<td>Kerri, age 4</td>
<td>• kitchen of family’s home</td>
<td>• graduated guidance (physical, verbal, gestural prompts)</td>
<td>• decreased problem behaviors • increased requesting using SGD</td>
</tr>
<tr>
<td>Trembath, Balandin, Togher, &amp; Stancliffe (2009)</td>
<td>To examine the effects of peer mediated naturalistic teaching on social communication, both with and without an SGD, during unstructured play sessions.</td>
<td>Jeremy, age 4; Aaron, age 5; Shane, age 3</td>
<td>• preschool classroom</td>
<td>• naturalistic teaching, peer modeling, verbal prompts</td>
<td>• increased communication, but results were sustained for only 1 student • generalization to one additional activity</td>
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</table>
It is clear from Table 1 that a majority of studies to date have used systematic instructional procedures that incorporate various types of prompts to help the target individual produce the desired SGD-directed behavior. For example, in many of the studies, physical, gestural, or verbal prompts were provided by an adult directly to the individual with ASD to teach requesting using an SGD. No research to date has incorporated less directive “aided language modeling” (Drager et al., 2006) strategies to teach SGD use to children with ASD. It is also clear from Table 1 that only two studies to date (Schepis et al., 1998; Trembath et al., 2009) have targeted SGD use for social interactions other than requests between individuals with ASD and their speaking partners. This is especially unfortunate in that difficulty with social interaction is one of the core deficits seen in ASD, and remediation in this area is critically important for individuals both with and without functional speech. The literature relevant to aided language modeling and social interaction interventions for children with ASD will be addressed in the sections that follow.

**Aided Language Modeling Approaches**

Aided language modeling approaches are strategies developed to augment receptive language comprehension and expand vocabulary for individuals with little or no functional speech (Drager et al., 2006). Differing only by procedure, these approaches include the System for Augmenting Language (Romski & Sevcik, 1996), Aided Language Stimulation (Goossens’, 1989), Natural Aided Language (Cafiero, 2001), Aided Language Modeling (Drager et al., 2006), and Aided AAC Modeling (Binger & Light, 2007), all of which incorporate communicative partner modeling in conjunction with verbal output. These techniques were all developed to resemble the way natural speakers learn to comprehend and generate language (Dada & Alant, 2009).
The System for Augmenting Language (SAL)

The System for Augmenting Language (SAL) is an AAC intervention technique designed to supplement speech and facilitate communication. SAL is composed of five essential components: (1) a speech generating device, (2) vocabulary words that are selected on an individual basis and the accompanied by graphic symbols, (3) use in naturalistic settings that encourage symbol use, (4) models of symbol use that are provided by communicative partners, and (5) a resource and feedback mechanism used to monitor ongoing usage (Romski et al., 2009). All five components must work together to facilitate the process of language acquisition (Romski & Sevcik, 1996).

In the original SAL study, 13 youth with severe intellectual disabilities (two of whom had autism) were taught to use SAL to communicate successfully with adults (Romski, Sevcik, Robinson, & Bakeman, 1994) and with peers (Romski, Sevcik & Wilkinson, 1994). The participants were divided into two groups; one group used the SAL exclusively at home, and the other used SAL at school. Initially, 12 symbols were selected for each participant from three categories (food, drink, utensils), and six additional lexigrams representing leisure items added after each participant met criteria for comprehension on the first 12 items. Trained communicative partners (parent and teachers) implemented the SAL during mealtimes and, eventually, during daily activities (i.e., leisure, snack). Communicative partners were required to provide feedback to researchers on regular basis to monitor ongoing use of the SAL. Results indicated that participants were better able to convey information and interact socially with adults in both environments following SAL instruction.

More recently, the SAL has proven to be effective with 11 toddlers who were later diagnosed with ASD (Romski et al., 2009). Romski and her colleagues conducted a
randomized control study with three groups: parents who implemented the original SAL procedure with their children to augment communicative input (ACI), parents who implemented a variation of the SAL to augment communicative output (ACO), and parents who were taught strategies to encourage spoken communication (SC). Results indicated that toddlers in the ACI and ACO conditions were able to communicate using symbols after 18 sessions. In contrast, toddlers in the SC condition produced few spoken words after 18 sessions, including a very small portion of the target vocabulary (Romski et al., 2009). These findings suggest a possible role for the use of SAL in communication interventions for individuals with ASD.

**Aided Language Stimulation**

In Aided Language Stimulation (ALS), a communicative partner (i.e., teacher, therapist, parent, etc.) touches a graphic symbol on a communication board (e.g., DOG) while simultaneously speaking the word (e.g., "dog"), during natural communicative exchanges (Goossens’ 1989). This interactive strategy utilizes a least-to-most prompting hierarchy and graphic symbols to engage in initiations, responses, questions, and comments (Goossens’, 1989). ALS is aimed at increasing receptive language capabilities, providing input that is approximately 80% statements and 20% questions (Goossens’ 2000, as cited in Dada & Alant, 2009). The 80:20 ratio of statements-to-questions places more emphasis on the speaking partner and less emphasis on the child for communicative interaction.

Only a few research studies on the effectiveness of ALS have been published to date, and none have involved children with ASD. Goossens’ (1989) was the first to employ ALS with a 6-year old girl (Jessica) with cerebral palsy. During pretend play activities (i.e., undressing/dressing a doll), an adult used ALS strategies to model the interactive use of PCS
that were worn on her vest and placed in a standing frame secured to Jessica’s wheelchair. The adult facilitator expanded Jessica’s communicative attempts with PCS both verbally and graphically. Over a 7 month period, Jessica learned to use eye gaze to communicate with the PCS and eventually developed functional speech consisting of 2-3 word combinations. In other populations, ALS also has been found to increase symbol comprehension in two children with Down syndrome (Harris & Reichle, 2004), facilitate vocabulary comprehension in three children with cerebral palsy and one with Down syndrome (Dada & Alant, 2009), enhance syntactic performance in individuals with a variety of communication deficits (Bruno & Trembath, 2006), and increase the use of AAC in adults with developmental disabilities (Beck, Stoner, & Dennis, 2009).

**Natural Aided Language**

Natural Aided Language utilizes PCS depicting selected vocabulary during highly reinforcing activities (Cafiero, 2001). Multiple, environmentally-specific picture boards are placed around the environment (e.g., a classroom), and when an individual initiates communication with a PCS (e.g., DOG), an adult facilitator: (1) repeats the communication using the picture board (e.g., DOG); (2) expands the communication by incorporating additional PCSs (e.g., DOG and MILK); and (3) shapes communication by prompting correctness or completeness of the original communicative unit generated by the user (e.g., The DOG spilled the MILK); (Cafiero, 2001).

Cafiero (2001) used natural aided language to increase the receptive and expressive PCS vocabulary in a 13-year-old boy, Timothy, with autism. Language boards specific to activities within the special classroom (e.g., breakfast, academics) were made available to Timothy. Staff were trained to interact with Timothy using the language board and to address
all of Timothy’s communicative initiations by modeling, expanding, and shaping his communicative attempts. Results showed an increase in communication and decrease in problem behaviors such as bolting from the classroom.

**Aided Language Modeling (ALM)**

Aided Language Modeling (ALM) is an interactive AAC approach employing visual picture symbols in conjunction with speech in the context of naturally reinforcing play activities (Drager et al., 2006). During highly motivating recreational play, a speaking communication partner: 1) points to an object in the environment with his/her index finger (e.g., a dog); 2) then, points to a graphic symbol of the object (e.g. DOG); and 3) simultaneously, says the label of the object (e.g., “*dog*”).

Drager et al. (2006) used this approach to teach receptive and expressive symbol comprehension of graphic and verbal stimuli in two children with autism. During three highly reinforcing activities for each participant (e.g., playing dollhouse or playing on a playground), the researcher pointed to a target object, pointed to the corresponding graphic symbol on the communication board, and simultaneously vocalized the name of the object. ALM was found to increase symbol comprehension (i.e., identification) and production (i.e., labeling) across three stimulus conditions (graphic alone, verbal alone, graphic + verbal). Post-intervention probes revealed that both participants maintained criterion level rates of responding for both variables.

**Aided AAC Modeling**

The most recent aided modeling approach, termed Aided AAC Modeling, incorporates the use of multi-symbol combination models. During naturally motivating
games and activities, an adult 1) sequentially touches two symbols on a communication board (e.g., DOG and MILK); 2) verbally labels both symbols while touching them (e.g., "dog" and "milk"); and 3) utilizes the symbols in sentence form (e.g., The DOG spilled the MILK). Using this method, Binger and Light (2007) taught five children with developmental disabilities to produce multi-symbol messages while engaging in imaginative play scenarios. Four of the children met criteria for generalization and maintenance and were able to produce multi-symbol messages independently during novel play scenarios.

Table 2 summarizes the similarities and differences among the five aided language modeling approaches. To date, all of the research on aided language modeling has been conducted on an individual basis, by an adult communicative partner, with a majority of the target words consisting of nouns (Dada & Alant, 2009). Augmented input has been focused on specific target items, with social interactions consisting primarily of input from the communicative partner (Dada & Alant, 2009). Further research is needed to determine the effectiveness of aided language modeling for the purpose of social interaction, occurring with natural speakers, in natural contexts.
Table 2. Similarities and differences among five aided language modeling approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Adult points to picture symbols in conjunction with natural speech</th>
<th>Adult and learner are provided with a speech-generating device (SGD)</th>
<th>Utilizes naturally reinforcing environments or activities</th>
<th>Other Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>System for Augmenting Language (SAL)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>• resource and feedback mechanism used to monitor ongoing usage by adults</td>
</tr>
<tr>
<td>Aided Language Stimulation</td>
<td>X</td>
<td></td>
<td>X</td>
<td>• primarily aimed at increasing receptive language</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• emphasis is on adult input, with less focus on child output</td>
</tr>
<tr>
<td>Natural Aided Language</td>
<td>X</td>
<td></td>
<td>X</td>
<td>• utilizes child-initiated opportunities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• prompts correctness or completeness of child communicative attempts</td>
</tr>
<tr>
<td>Aided Language Modeling</td>
<td>X</td>
<td></td>
<td>X</td>
<td>• adult points to referent prior to symbol</td>
</tr>
<tr>
<td>Aided AAC Modeling</td>
<td>X</td>
<td></td>
<td>X</td>
<td>• adult says and points to a two-symbol sequence and then says the entire sentence</td>
</tr>
</tbody>
</table>
Social Interaction and ASD

Difficulties with social interaction are established characteristics in individuals with ASD. Kanner (1943) first identified several social deficits associated with PDDs, including the inability to interpret social nuances (i.e., facial expressions, body language), absence or delay of social gestures (i.e., pointing and waving), and social aloofness. Other noted deficiencies in social behavior include eye contact, isolation from peers, joint attention and lack of social reciprocity (Kroeger, Shultz, & Newsom, 2007; Wolfberg & Schuler, 1999). Lacking these essential elements to participate in social exchanges can hinder the development of positive relationships, including those with peers (Mackay, Knott & Dunlop, 2007). With limited social skills, children with autism are likely to be excluded from peer interactions and are unlikely to develop peer socialization skills as a result (Wolfberg, 2003). Thus, acquiring the skills to engage in positive, meaningful social interactions is vital to child development and, ultimately, to behavioral and social adjustment in adulthood (Brown, Odom & Conroy, 2001). Two primary approaches have been used to teach social interaction skills in general to individuals with ASD: 1) child-with-ASD centered approaches and 2) peer-centered approaches.

Child-with-ASD-Centered Interventions

Child-centered interventions involve adults (e.g., teachers, parents, etc.) directly teaching specific skills to a child with ASD (i.e., social initiations, responses, commenting, turn-taking) using prompting and reinforcement (McConnell, 2002). A number of strategies have been developed to teach these skills, including video modeling, systematic instruction, and Social Stories™.
**Video modeling.** Video modeling has been shown to be an effective strategy to teach key skills needed for social interaction to children with autism (Kroeger et al., 2007; Maione & Mirenda, 2006; Taylor, Levin & Jasper, 1999). For example, in a study by Kroeger et al., 25 children with autism were taught play skills either through direct teaching or unstructured play sessions (control group). Children in the direct teaching group viewed a video model demonstrating a variety of play skills (e.g., ball play, taking turns, pretend play), and were prompted and reinforced by facilitators in subsequent free play sessions to practice the modeled skills. Although both groups showed increases in social behaviors, the direct teaching group made greater social skill gains (Kroeger et al., 2007). Increases in reciprocal play engagement (Nikopulos & Keenan, 2007) and the use of social language during peer or sibling play activities (Maione & Mirenda, 2006; Taylor et al., 1999) have also been documented as a result of video modeling in children with ASD.

**Systematic instruction.** Systematic instructional approaches have also been used extensively to teach social skills to children with autism. In his 2002 review of social studies research in autism, McConnell identified 9 studies in this regard, and numerous additional studies have been added since 2002 as well. For example, a recent study by Garfinkle and Schwartz (2002) used a system of least-to-most prompts to increase social skills in three children with autism. Small group instruction was provided, during which children received direct prompting and reinforcement for imitating peers. As a result, the target children’s proximity to peers, frequency of peer interactions, and frequency of peer imitation were all found to increase in both small group and free play settings. In another recent study using systematic instruction, Liber, Frea, and Simon (2008) used a graduated time delay procedure to teach social skills to three boys with autism. Using prompting and reinforcement, all three
boys learned appropriate play with toys, initiations towards peers, and requesting peer assistance.

**Social Stories™.** Another strategy that has been used to teach social skills is through the use of Social Stories™ (Delano & Snell, 2006; Quirmbach, Lincoln, Feinberg-Gizzo, Ingersoll, & Andrews, 2009; Scattone, Tingstrom, & Wilczynski, 2006) For example, Quirmbach et al. (2009) used Social Stories™ to teach social behaviors (i.e., greeting, requesting, asking a child to play, and accepting another child’s choice of game) to 42 children with ASD. Social behaviors were found to increase in a majority of the children, especially those who scored higher on tests of verbal comprehension at baseline. Social Stories™ have also been found to enhance social commenting, requesting, and responding in children with ASD (Delano & Snell, 2006).

**Peer-Centered Interventions**

Peer-centered interventions are the most empirically supported type of social skill instruction for children with ASD (Bass & Mulick, 2007). Numerous studies have demonstrated the effectiveness of peers as social mediators for individuals with ASD (e.g., Harper, Symon & Freia, 2008; McConnell, 2002; Nelson, McDonnell, Johnston, Crompton, & Nelson, 2007; Odom, Chandler, Ostrosky, McConnell, & Reaney, 1992; Odom & Strain, 1986; Strain, Kerr & Ragland, 1979). In peer mediated approaches, typically developing children evoke and facilitate social interactions with peers with ASD through social skills training and/or social play manipulations (including prompting and reinforcement) (McConnell 2002). Various approaches that utilize peers as intervention agents have been examined empirically, including direct teaching of peers, peer networks, integrated play groups, and peer buddy systems.
**Direct teaching of peers.** Typically developing peers are often directly trained to engage in behaviors that promote the social interactions in children with ASD. Strain and his colleagues were pioneers in this area and conducted numerous studies involving peer coaching to produce gains in the social behaviors of children with ASD (e.g., Odom & Strain, 1986; Strain et al., 1979; Strain, Shores, & Timm, 1977). Current researchers still utilize many of the methods employed by Strain and his colleagues to train peers as successful social interventionists. For example, Thiemann & Goldstein (2004) taught typically developing peers to increase social communication in five school-age children with PDD. Peers were trained in specific skills (i.e., answering questions, initiating conversation, complimenting) and received feedback regarding their use of these strategies during interactions with playmates with PDD. Although the overall rate of social interactions between the peers and children with ASD increased as a result, social initiations by the children with PDD did not. However, when direct instruction using a written text cue was implemented with the children with PDD, initiations increased as well. More recently, in a study by Harper et al. (2008), peers were trained using Pivotal Response Training to use a variety of strategies (i.e., gaining attention, narrating play, reinforcing the target child, turn-taking) to initiate and facilitate play with a peer with autism during recess. Both boys with autism showed significant improvements in social initiations and responses during recess, and these social behaviors were maintained after the treatment was withdrawn.

**Peer networks.** Peer networks are groups of typically developing peers who provide support for individuals with disabilities (DiSalvo & Oswald, 2002). For example, in a study by Kamps, Potucek, Lopez, Kravits, and Kemmerer (1997), groups of 2-5 peers were selected and trained to form social networks for three students with autism. All children
engaged in structured activities using social scripts and were prompted and reinforced for social interactions across four different settings, introduced sequentially. Significant increases in the duration of social interactions were noted for all participants across all settings. Peer networks have also been shown to be effective for increasing the frequency of social interactions (Garrison-Harrell, Kamps & Kravitz, 1997) and for improving positive attitudes toward individuals with developmental disabilities (Haring & Breen, 1992).

**Peer buddy systems.** In a “peer buddy” system, a child with ASD is assigned to a typically developing peer and both peers are instructed to participate in various activities together (Laushey & Heflin, 2000). For example, Laushey and Heflin (2000) taught two 5-year-old boys with autism to interact with buddies in free play situations. Both members of each buddy pair were provided with instruction related to following rules that included stay, play, and talk with your buddy. Results indicated significant increases in appropriate social interactions (i.e., asking/responding to questions, requesting attention, waiting for turns, and giving eye contact) for the children with autism compared to a control group of two children who were not assigned a buddy.

Kohler, Greteman, Raschke, and Highnam (2007) used a peer buddy intervention to increase social interactions between a child with autism and six of her peers. All children were trained on appropriate social behaviors (i.e., sharing, requesting, giving compliments, etc.) and the typically developing peers were also instructed to stay, play, and talk to their buddies with autism. Direct teacher support was provided for the typically developing peers, including reinforcement and prompting. The authors reported increases in the frequency of social initiations by peers toward their classmates with autism, increased initiations by the
peers with autism, and high levels of social exchanges that were maintained when the intervention was withdrawn.

**Integrated play groups.** One of the most well-known models for peer-mediated instruction is the Integrated Play Groups (IPG) approach, developed by Pamela Wolfberg and Adriana Schuler (1993). IPGs are composed of an adult facilitator who guides social interactions between children with ASD and their typically developing peers in natural, semi-structured settings. Typical IPGs consist of 2-3 “expert” players and 1-2 “novice players” and are conducted two to three times per week over the school year. “Expert players” are socially competent, typically developing peers and/or siblings. “Novice players” are children meeting criteria for ASD. Play materials and activities are strategically selected by an adult facilitator to optimize engagement and match the developmental level of the child with ASD.

Research has determined that IPGs can result in increased social interactions with peers, increased functional play skills, and decreased stereotypic behavior among children with ASD (Wolfberg, 2003; Wolfberg & Schuler, 1993). In addition to the positive effects on children with ASD, peer confederates may attain greater sensitivity, knowledge, understanding of individual differences, and positive attitude changes through participation in IPGs (Wolfberg & Schuler, 1999). Relationships between typical peers and children with ASD may also became more balanced and reciprocal in nature as a result, as peers began to develop friendships that extend beyond scheduled play times (Wolfberg & Schuler, 1999). However, no research to date has examined the impact of such peer-mediated play group approaches on social interaction or communication development in children with ASD who use SGDs.
Statement of the Problem and Research Questions

Research indicates that typically developing peers are ideal intervention agents for teaching social interaction skills to children with ASD because they serve as natural discriminative stimuli for social exchanges, thus promoting generalization and maintenance (Odom et al., 1992). In addition, the contexts in which social interventions are conducted are important to the outcome, especially for students with ASD who use AAC techniques such as SGDs. Such students are not likely to be exposed to natural communities of competent SGD users who are able to model social exchanges in this medium (Mirenda, 2003). However, previous research suggests that peers can be recruited to support social interactions in the context of naturally occurring routines and environments (e.g., classrooms) that will maintain newly-acquired social responses, further enhancing generalization (Baer, Wolf, & Risley, 1987). Further research is needed to examine the effectiveness of teaching peers to support social interactions with classmates with ASD who use SGDs.

The vast majority of SGD research to date has utilized adult-mediated strategies to teach individuals with ASD to request specific items, in highly structured contexts. While a few studies have examined the use of aided language modeling approaches with children with ASD, these studies have also focused primarily on teaching symbol names and labels, rather than social interaction. Only one study to date has investigated the use of aided language strategies to promote SGD use for social interaction in natural contexts (e.g., play activities) through the use of peer-mediated instruction with preschoolers (Trembath et al., 2009). However, this study failed to control for the types of activities played by the participants, and did not measure the appropriateness of the communicative behaviours exhibited by the participants with ASD. The present study was designed to address this gap
in the current research by controlling for these elements while using a novel aided language modeling strategy and a peer-directed teaching strategy with elementary school children with ASD.

This study aimed to address the following questions:

(1) Can peers be taught to support SGD use by classmates with ASD in social play routines?

(2) Is there a functional relationship between peer-mediated support during social game routines and an increase in spontaneous appropriate communicative acts by participants with ASD who use SGDs? and

(3) Do social interactions between participants with ASD and their classmates increase in non-experimental social/play settings (e.g., classroom recess) following intervention?

It is hypothesized that all three of these questions will be answered in the affirmative.
CHAPTER 2: Method

Approval for this study was obtained in February 2009 from the Behavioral Research Ethics Board of the Office of Research Services and Administration at the University of British Columbia (Appendix A).

Participant and Confederate Recruitment

Ms. Lorraine Kamp, a speech-language pathologist in the Surrey School District who works for SET-BC, acted as the facilitator during the study. She identified prospective participants, provided letters of initial contact (Appendix B) and consent forms (Appendix C) to their parents, and acted as the peer trainer in the study. To be eligible to take part in the study, participants were required to:

(a) be between the ages of 9 and 12 years old
(b) have a diagnosis of autism or an autism spectrum disorder
(c) be able to understand spoken English
(d) be able to speak no more than 20 words in English or another language
(e) be able to make requests using at least 10 Picture Communication Symbols (Mayer-Johnson Co., 1994)
(f) have received a speech-generating device (SGD) from SET-BC within the 12 months prior to initiation of the study
(g) be able to use an SGD to make basic requests but not to engage in social interaction with peers
(h) be enrolled in a general education classroom in the Surrey School District
Three students with autism were invited to participate in the study; however, one participant engaged in moderate-to-high rates of self-injurious behavior that ultimately prevented his participation.

Three typically developing confederates who were nominated by the teachers in each of the remaining two participants’ classrooms were also invited to participate. Letters of initial contact (Appendix D), consent forms (Appendix E) and child assent forms (Appendix F) were provided by the facilitator to the parents of potential confederates, all of whom met the following criteria:

(a) they were in the same classroom as one of the participants
(b) they had no identified social, cognitive, or behavioral problems that were likely to interfere with the study.

All participants, confederates and peers were asked to sign a “consent to videotape” form (Appendix G).

Participants and Confederates

The two participants with ASD and their confederates are described in this section; all names are pseudonyms.

Ian

Ian was 11 years 4 months old when the study started. He is the youngest child in a low-income Korean family and lives with his mother and older sister. Ian was diagnosed with autism by a multidisciplinary team in November 2002. He was enrolled in an inclusive grade 6 classroom where he worked on a modified curriculum with the support of a full time special education assistant. No standardized language assessments were available, but the speech-language pathologist assigned to Ian reported that he could read at approximately a
grade 1 level and spoke only a few words, including “go” and “gu” meaning “good.” He
needed assistance with feeding and toileting, but could dress himself independently.

Ian had used a communication book with approximately 25 Picture Communication
Symbols (PCS) in it for 4 years prior to the study; he used 10 of these symbols to make
requests on a regular basis. Ian learned to use the symbols with instruction according to the
Picture Exchange Communication System (Bondy & Frost, 1994) and had reached Phase 4 of
this procedure. He received a Vantage Lite™ speech-generating device 1 month prior to
initiation of the study, and his individual education plan (IEP) contained goals related to his
use of the device for requests and basic social communication with peers.

Ian engaged in a number of problem behaviours, including bolting, screaming,
hitting, and minor self-injury. His social skill repertoire consisted of approaching others and
using gestures to initiate interactions. Ian was not independent in recreation and leisure skills,
and often engaged in stereotypic behaviours such as hand flapping, putting his fingers in his
mouth, and sound repetition.

Confederates. Ian’s confederates -- Michelle, Colin, and Nathan -- were all 12 years
old and had been classmates of Ian’s for 1 month prior to study initiation. They all met the
eligibility criteria for the study, as described previously.

Max

Max was 11 years 1 month of age when the study started. He had been diagnosed
with autism in 2001 by a multidisciplinary diagnostic team at a local children’s hospital. No
family background information was available. Max was enrolled in an inclusive grade 6/7
classroom where he worked on a modified curriculum with the support of a full time special
education assistant. No standardized test data were available for Max. He was non-verbal
with the exception of a few echolalic utterances and he was not able to read. He was not independent in self-help, recreation, or leisure activities and required one-to-one support at all times.

Max had learned to use approximately 10 PCS symbols (to request break activities and to use the bathroom) prior to receiving his SGD, using the Picture Exchange Communication System (Bondy & Frost, 1994) in which he had reached Phase 3. Max had received a Springboard Lite™ speech-generating device 10 months before the study and used it to make basic requests when he was either highly motivated or when prompted to do so. Max’s IEP goal for the current school year to learn to use his SGD in social situations.

Max engaged in a number of problem behaviors, including hitting other people, hand flapping, jumping, and repetitive vocalizations. He initiated social interactions using gestures and physical direction.

Confederates. Megan, Luke, and Ron were all 11 years old. Megan and Rob had been Max’s classmates for 1 month and Luke had been his classmate for 1 school year prior to study initiation. All three met the eligibility criteria for the study, as described previously.

Setting and Materials

All instructional and probe sessions occurred in a separate room located in each participant’s school, during a time selected by each participant’s classroom teacher. Both of the rooms included a large table and at least four chairs. Materials for Ian’s session included four bingo cards, bingo markers and 25 pictures corresponding to the bingo cards. Two different Bingo games with Picture Communication Symbols were made using Boardmaker™ software; these included “playground/recess Bingo” and “2010 Olympic Games Bingo.” Figure 1 displays the playground/recess Bingo game that was used with Ian.
Materials for Max’s game (a version of “Concentration,” a matching game) included 18 pairs of matching Star Wars cards (see Figure 2). Edible treats were used as reinforcement for all participants and confederates at the end of each game session and included gummy candies, chips, and chocolate.

Both participants used SGDs that were provided to them by the provincial resource program for assistive technology, Special Education Technology-BC (SET-BC). Ian’s SGD was a Vantage Lite™ (Prentke Romich Co., see https://store.prentrom.com/product_info.php/cPath/11/products_id/80), a dynamic display device with synthesized voice output. The SGD was programmed with a game page that
included 15 messages with corresponding PCS symbols: “your turn,” “pick one,” “I need a marker,” “Oh no,” “Bingo,” “I win,” “I pick the treat,” “I almost had it,” “no cheating,” “my turn,” “this one,” “I’m winning,” and all confederates’ names. Figure 3 displays the page on Ian’s Vantage Lite™ that was used for the study.

**Figure 3. Ian’s Vantage Lite**

Max’s SGD was a Springboard Lite™ (Prentke Romich Co., see https://store.prentrom.com/product_info.php/cPath/11/products_id/8), a dynamic display device with synthesized voice output. Seventeen messages were programmed on a game page with corresponding PCS symbols, including: “Yay, I pick the treats,” “no cheating,” “no match,” “your turn,” “my turn,” “how many do you have?,” “I got a match,” “I saw that,” “who’s next?,” “this is hard,” “oh, oh, I know, I know,” “give me a clue,” “I got it,” “that’s my favourite,” and each of the children’s names. For sessions 26 and 27 only, five additional messages were added using printed words without symbols, in order to capitalize on Max’s interest in Star Wars-related utterances. The messages included “I have you now,” “I have a bad feeling about this,” “May the force be with you,” “Don’t underestimate the force” and “Let the Wookie win.” Figure 4 displays the page on Max’s Springboard Lite™ that was used for the study.
Measurement

Two sets of dependent variables were recorded in the study. The first set was recorded during intervention sessions to document communicative acts, target child independence, target child appropriateness, and the number of prompts delivered by the facilitator to the confederates (Appendix H). The second set was recorded during classroom generalization probes that were held immediately prior to and toward the end of intervention and included initiations and responses (Appendix I).

Intervention Variables

Communicative acts. This was the primary dependent variable in the study. A communicative act (CA) consisted of a gesture, verbal utterance, vocalization, or SGD activation and was separated by at least 5 seconds from the previous CA. All communicative acts (CAs) produced by the participants with ASD were transcribed from videotapes of each game session. CAs were coded according to the mode of communication, as follows: (a) SGD activations that were directed toward a confederate (via eye contact or body orientation); (b) hand or upper extremity gestures that were directed toward a confederate, the activity materials, or the SGD; (c) verbal utterances that were recognizable as English
words and were directed toward a confederate (Schepis et al., 1998); and (d) vocalizations that were not recognizable as English words but were directed toward a confederate (Schepis et al., 1998). Vocal stereotypic behaviours were excluded.

**Independence.** All CAs were coded as either prompted (i.e., produced by a participant with ASD as a direct result of corrective or directive attention provided by either the facilitator or a confederate, including expectant pauses and verbal, gestural, and physical prompts; Odom et al., 1992) or spontaneous (i.e., produced by a participant with ASD independently, without any type of prompt). Prompted CAs were recorded as induced by either the facilitator or by a confederate, and the number of prompt sets needed to elicit each CA was also recorded. A prompt set was defined as a sequence of one or more verbal, gestural, and/or physical prompts provided within 5 seconds of one another, with the goal of eliciting a CA (e.g., an SGD activation). Prompts that were required for game play rather than communication were not included, nor were confederate actions designed to orient the SGD toward a participant. The rate per minute of both spontaneous and prompted CAs was calculated by dividing the number of prompted (or spontaneous) CAs by the total number of minutes in a session.

**Appropriateness.** Data also were recorded regarding the appropriateness of each CA. Appropriate CAs were defined as those that were contextually suitable for the situation or interaction, while inappropriate CAs were those that were not contextually suitable. For example, an appropriate CA occurred if a participant used his SGD to say “Your turn” to indicate a confederate’s turn during the game. However, an inappropriate CA was recorded if a participant activated his SGD to say “That’s funny!” in the same situation. The rate per
minute of both appropriate and inappropriate CAs was calculated by dividing the number of appropriate (or inappropriate CAs) by the total number of minutes in a session.

**Prompts to confederates.** During the training portion of the study, the role of the facilitator was to teach the confederates how to prompt SGD use by the participant with ASD. Prompts were faded gradually over several training sessions, and the number of prompts provided by the facilitator to the confederates was recorded for each confederate interaction. All expectant pauses or verbal, gestural, and physical cues that were designed to elicit confederate prompts related to SGD use by a participant were recorded (Odom et al., 1992); however, prompts for game play alone were not included. The rate of confederate prompts per minute was calculated by dividing the total number of confederate prompts by the total number of minutes in a session.

**Classroom Generalization Measures**

Generalization probes took place in each participant’s general education classroom prior to and near the end of the study, during an indoor recess period. Up to 30 classmates were present during these 10 minute probes, which consisted of free time following lunch. Because of the number of students present and the level of activity during the probes, detailed coding of interactions was not possible. Thus, only the rates per minute of initiations and responses between participants and peers or confederates were coded for these sessions.

**Initiations.** Initiations were defined as verbal or gestural behaviors or SGD activations emitted by a participant toward a conferee or peer (or by a peer or confederate toward a participant) that was not preceded by a social behavior within 3 seconds (Odom et al, 1992). Only interactions that involved the participants were measured during generalization probes. The rate of initiations per minute was calculated by dividing the total
number of initiations by the number of minutes per session.

**Responses.** A response was defined as a verbal or gestural behavior or an SGD activation emitted by the participant toward an initiating peer or confederate (or by a peer or confederate toward an initiating participant) (Odom et al., 1992). The rate of responses per minute was calculated by dividing the total number of responses by the number of minutes per session.

**Treatment Fidelity**

The researcher examined 100% of the videotaped sessions and evaluated the extent to which the facilitator implemented the intervention as designed. An implementation checklist (Appendix J) was used to code the facilitator’s performance and a total percent correct score was calculated for each session.

**Social Validity**

At the end of intervention, a short Likert-type questionnaire was completed by each of the confederates (Appendix K). The measure asked about confederates’ perceptions of the study, including whether or not they enjoyed participating in the play sessions, their perception of the effectiveness of the play sessions for their classmate with ASD, and whether or not they would be willing to participate in similar interventions in the future.

**Reliability**

**Inter-observer agreement.** The researcher trained a second observer who was blind to the purpose of the study to code all of the dependent variables from the videotapes. The observer was trained until she obtained at least 90% accuracy (compared to researcher codings) across two consecutive tapes. The observer then coded 29% of the videotapes selected at random across baseline, training, and intervention sessions, using a scoring sheet
and operational definitions sheet for each target behavior. Inter-observer agreement was calculated across all conditions by dividing the number of agreements by the total number of agreements plus disagreements, multiplied by 100. Table 3 displays the inter-observer agreement ratings for communicative acts, appropriateness, independence, and confederate prompts across participants during all phases. Disagreements were resolved by consensus.

**Table 3. Summary of inter-observer agreement data across participants and dependent variables**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Ian</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean %</td>
<td>Range %</td>
</tr>
<tr>
<td>Communicative acts</td>
<td>96.3</td>
<td>90-100</td>
</tr>
<tr>
<td>Appropriateness</td>
<td>98.0</td>
<td>88 - 100</td>
</tr>
<tr>
<td>Independence</td>
<td>76.5</td>
<td>69 - 90</td>
</tr>
<tr>
<td>Prompts to confederates</td>
<td>96.0</td>
<td>88 - 100</td>
</tr>
</tbody>
</table>

**Treatment fidelity inter-observer agreement.** A second observer coded 25% of the videotaped play sessions to examine the accuracy of treatment fidelity ratings by the researcher. The observer was provided with the same implementation checklist (Appendix J) used to assess fidelity. Inter-observer agreement was calculated by dividing the number of agreements by the total number of agreements plus disagreements, multiplied by 100. The mean reliability for treatment fidelity for both Ian and Max was 96% (range = 92%-100%).

**Design**

A multiple-baseline design (Baer, Wolf, & Risley, 1968) with multiple probes was employed across two participants and included three phases: baseline, training, and
intervention. Baseline data were collected for both participants during play sessions with confederates. After a stable baseline was established for Ian, confederate training was initiated for him. Once the training criterion was met by Ian’s peers, intervention commenced with him and training was initiated with Max’s confederates. When the training criterion was achieved by Max’s peers, intervention began for him. Classroom generalization sessions were conducted prior to the first baseline data collection session and near the end of the study for both participants.

**Procedure**

**Generalization Probe 1**

The purpose of the generalization probes was to examine the impact of the intervention on social interactions in the target students’ classrooms with untrained peers. An initial observation (10 minutes) during an unstructured free time period (i.e., indoor recess) was conducted in each participant's classroom, in order to assess peer interactions and SGD use prior to intervention. During this activity, participants were given access to their SGDs but neither participants nor their peers (including confederates) were provided with instructions or support related to SGD use. All probe sessions were videotaped for data analysis with regard to the dependent variables identified previously.

**Baseline**

Baseline observations were conducted during game play sessions until the data were stable over at least three sessions for one participant. Baseline sessions varied in length, depending on how long it took for someone to win each game. On average, Ian’s baseline sessions were 9 min. long (range = 7-11 min.) and Max’s were 11.5 min. long (range = 8-14 min.). During baseline, the facilitator provided prompts for game set-up, established the rules
for the game (when needed), and selected a player to start. The confederates and the
participants were then instructed to, "Play [game]." The SGD was turned on and was easily
accessible to all participants. The facilitator remained nearby and provided hand-over-hand
assistance to the participant with ASD as required to keep the game/activity in play. The
game continued to its natural endpoint (i.e., a player got Bingo in Ian’s case, or all Star Wars
matching pairs were selected in Max’s case). The participant and confederates were then
provided with small edible treats and dismissed.

**Confederate Orientation**

Following baseline, one 10-minute SGD orientation session was conducted with each
group of confederates by the facilitator. The confederates were taught how to use the
participant’s SGD and had opportunities to practice activating it. They were also provided
with basic information such as how to navigate to/from the game page and were shown all
messages on the game page with examples of situations in which each of the messages could
be used. Confederates were informed that they would be responsible for prompting the
participant, and a system of least-to-most prompts (verbal, gestural, physical) was discussed
and demonstrated. Each confederate then had an opportunity to practice using the SGD on
his or her own. Orientation sessions occurred during a time selected by each participant’s
classroom teacher.

**Confederate Training**

Training sessions took place 2-4 times per week. Again, these sessions varied in
length, depending on how long it took for someone to win each game. On average, Ian’s
training sessions were 13 min. long (range = 7-22 min.) and Max’s were 12.5 min. long
(range = 8-18 min.). During training, the facilitator set up the game materials and established the rules for the game (this was required during the first few sessions only). The SGD was turned on, placed in front of the participant and/or confederates, and set to the game page with the volume turned up. At the beginning of each training session, the facilitator provided brief feedback to confederates regarding their performance during the previous session. A player was then chosen to start the game and the confederates and participants were instructed to, "Play [game]."

During training, the facilitator prompted confederates to model use of the SGD and to prompt SGD activations by participants, using an increasing hierarchy of verbal, verbal + gestural, and physical prompts. Facilitator prompts to the confederates for SGD modeling were provided within 10 seconds whenever an opportunity occurred within game play to do so; for example, the facilitator prompted each confederate to activate “my turn” when it was his/her turn, or “your turn + a peer’s name” at the end of each turn. Prompts for SGD activation by participants were provided similarly. For example, if Ian was close to getting bingo, the facilitator prompted a confederate to point to the “I almost have it” button on the SGD; or if Max got a match in the Stars Wars game, he was prompted to activate “I got a match.” Facilitator prompts were faded gradually until the confederates were able to support participants' SGD use without adult assistance. No prompts were provided by the facilitator directly to a participant unless required for game play. The game was allowed to continue until its natural end point (i.e., all matching pairs had been selected or someone got “Bingo”). The training phase was completed when the confederates required ≤0.2 facilitator prompts/min. over two consecutive sessions (i.e., ≤1.0 prompt/5 min.).
**Intervention**

Intervention sessions took place 2-4 times per week. On average, Ian’s intervention sessions were 10.5 min. long (range = 8.5-13 min.) and Max’s were 10 min. long (range = 8-11 min.). The initial set-up sequence during intervention was identical to that during training. At the beginning of each intervention session, the facilitator provided brief feedback to confederates regarding their performance during the previous session.

During intervention, the facilitator provided prompts to the confederates only when they failed to model or encourage SGD use when an opportunity presented itself to do so, as described previously. The facilitator provided no prompts to the participants unless required for game play. The game was allowed to continue until its natural end point (all matching pairs had been selected or someone got “Bingo”).

**Generalization Probe 2**

Close to the end of intervention for each participant (on a day selected by each child’s classroom teacher), a second classroom generalization probe was conducted using the same protocol described in Generalization Probe 1.

**Data Collection and Analysis**

All baseline, intervention, and generalization probe sessions were videotaped during each phase of the study. The researcher coded the entire videotape of each session for the dependent variables, as described previously.

The effectiveness of the intervention was assessed by visual inspection of the data following rules of evidence for single subject research methodology. Changes in the frequency of prompts to confederates by the facilitator and changes in the rate of CAs by participants across phases determined the impact of the intervention.
CHAPTER 3: Results

The main goals of this study were to address the following questions: (1) Can peers be taught to support SGD use by classmates with ASD in social play routines? (2) Is there a functional relationship between peer-mediated support during social game routines and an increase in spontaneous appropriate communicative acts by participants with ASD who use SGDs? and (3) Do social interactions between participants with ASD and their classmates increase in non-experimental social/play settings (e.g., classroom recess) during and following intervention? For questions 1 and 2, data were analyzed by examining visual graphs for changes in levels and trends across phases. For question 3, data from generalization probes were summarized in a comparison table.

Training Results

Data in this section are related to question 1: “Can peers be taught to support SGD use by classmates with ASD in social play routines?” Results show that peers learned to support SGD use by classmates with ASD in social play routines, as evidenced by the high rates of confederate prompts to participants, even after facilitator prompts to the confederates were faded. Figure 5 displays these results.
Figure 5. Prompts per minute by the facilitator to confederates and by the confederates to participants
Baseline

During baseline, facilitator prompts to the confederates (FtoC) were at zero levels across four sessions for both Ian and Max. Prompts by the confederates to the participants (CtoP) were at zero for Max and averaged 0.07 for Ian (range = 0-0.18). The prompts in session 3 for Ian occurred when he began to activate buttons on his SGD at random, and the confederates encouraged him to activate an appropriate button instead. The prompts in session 4 occurred when two confederates both called out the name of a game card (“race”) and Ian repeated it.

Training Phase

**Ian.** Nine sessions were required for Ian’s confederates to complete the training phase. The rate of FtoC prompts showed an increasing trend for the first three training sessions and a decreasing trend for the final six, as the facilitator began to fade her prompts to the peers. Overall, the mean rate of FtoC prompts was 0.41/min (range = 0.14 to 0.8). The training criterion of ≤0.2 prompts/min. over two consecutive sessions was met for Ian’s confederates in sessions 12 and 13. During training, CtoP prompts followed a pattern that was similar to FtoC prompts, with an initially increasing trend followed by a decreasing trend. Overall, CtoP prompts for Ian occurred at a rate of 0.98/minute (range = 0.70 – 1.6) during training.

**Max.** Seven sessions were required for Max’s peers to meet the training criterion. The rate of FtoC prompts increased with the initiation of training, remained stable for the first five sessions, and decreased during the final two sessions. Overall, the mean rate of FtoC prompts for Max was 0.34 (range = 0.09 to 0.57/min.). The training criterion of ≤0.2 prompts/min. over two consecutive sessions was met for Max’s confederates in sessions 21
and 22. During training, CtoP prompts showed an increasing trend for the first five training sessions and a decreasing trend for the final two. Overall, CtoP prompts for Max occurred at a rate of 1.04/min. (range = 0.67 – 1.34/min.) during training.

**Intervention**

**Ian.** For Ian, FtoC prompts were quite low and were generally stable, with a mean of 0.1 prompts/min. overall (range = 0 to 0.38/min.). The exception was during session 22, which occurred immediately after Christmas break and in which the confederates required more prompting by the facilitator, presumably because their instructional skills had deteriorated over the break period. Otherwise, the data show that Ian’s peers were able to implement the intervention with very minimal facilitator support and required no prompts during the final two sessions (sessions 24 and 25). CtoP prompts occurred at a stable rate during intervention, averaging 0.57/min (range = 0.31-0.82/min.).

**Max.** For Max, FtoC prompts were very low and stable, with an average of 0.02 prompts/min. (range = 0-0.09/min.). Even after Christmas break, Max’s peers were able to implement the intervention with very minor facilitator support. As was the case for Ian, FtoC prompts for Max were at zero during the last two sessions of the intervention phase. In contrast, CtoP prompts were more variable, averaging 0.66/min (range = 0.22-1.1/min.).

**Prompt Effectiveness**

Related to the issue of peer training and support is the effectiveness of the prompts delivered by peers during both training and intervention In this study, peers were expected not only to prompt participants’ communication using their SGDs, but to do so in ways that achieved the desired outcome efficiently and effectively. In this regard, an effective prompt was defined as one that directly resulted in a CA by a participant with ASD. The percentage
of prompted CAs that were preceded by only one prompt (i.e., those that were effective) and by more than one prompt is displayed for Ian and Max in Table 4.

Table 4. Percentage of prompted CAs requiring one prompt or more than one prompt for Ian and Max

<table>
<thead>
<tr>
<th>Number of Prompts</th>
<th>Ian Training</th>
<th>Ian Intervention</th>
<th>Max Training</th>
<th>Max Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>One prompt</td>
<td>90.2</td>
<td>80.6</td>
<td>84.8</td>
<td>97.1</td>
</tr>
<tr>
<td>More than one prompt</td>
<td>9.8</td>
<td>19.4</td>
<td>15.2</td>
<td>2.9</td>
</tr>
</tbody>
</table>

In general, prompts by the confederates to both participants were highly effective during both training (when the facilitator was prompting the confederates) and intervention (when, for the most part, the facilitator was not prompting the confederates). For Ian, effective prompts occurred 90.2% of the time during training and 80.6% during intervention; for Max, these proportions were 84.8% and 97.1%, respectively.

**Intervention Results**

Data in this section are related to question 2: “Is there a functional relationship between peer-mediated support during social game routines and an increase in spontaneous appropriate communicative acts by participants with ASD who use SGDs?” A functional relationship (i.e., demonstration of experimental control) requires a minimum of three demonstrations of the experimental effect at three different points in time across different participants (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005). Because only two participants were involved, and because the change between baseline and intervention was not dramatic for one of the participants (Figure 6), it was not possible to verify a functional
relationship unequivocally. However, there was a change in the level of spontaneous appropriate CAs for both participants within one intervention session, and this change did not occur until the intervention was initiated. Thus, the results provide suggestive evidence in support of intervention effectiveness.

For single-subject experimental designs, the Percentage of Non-overlapping data (PND) can be applied as an outcome metric in addition to visual inspection of graphic results (Scruggs, Mastropieri, & Castro, 1987). The PND method requires the calculation of non-overlap between baseline and successive intervention phases by identifying the highest data point in baseline and determining the percentage of data points during intervention exceeding this level. PND scores can range from 0% to 100% and can be interpreted using the conventions set by Scruggs, Mastropieri, Cook, and Escobar (1986). A PND greater than 90% is indicative of a “highly effective” intervention, a PND between 70% and 90% reflects “fair effectiveness,” a PND between 50% and 70% is considered of “questionable effectiveness,” and a PND below 50% reflects an “unreliable or ineffective” treatment. The PND for spontaneous CAs was 100% for Ian and 80% for Max, suggesting a fair to high level of change between baseline and intervention (i.e., fair to high “effectiveness,” in PND terms.)
Figure 6. Total appropriate communicative acts by participants
Total Spontaneous Appropriate Communicative Acts

**Baseline.** During baseline, total spontaneous appropriate CA’s for both Ian and Max were at zero levels for all four sessions.

**Intervention.** An immediate increase in spontaneous appropriate CAs was observed for Ian during intervention, with CAs increasing to a mean of 0.88/min (range = 0.78-1.06/min/). The rate of CAs remained stable across the first three sessions and then showed an increasing trend starting with session 20. The results were less dramatic for Max, with no change in level until his second session (session 24) and considerable variability thereafter. Overall, the mean rate of spontaneous appropriate CAs for Max was .30/min (range = 0 to 0.57/min.), which was higher than his baseline rate of zero. The PND for spontaneous CAs was 80% for Max and 100% for Ian, indicating a fair to high level of change between baseline and intervention for the two participants, respectively.

Total Prompted Appropriate Communicative Acts

**Baseline.** Ian’s average rate of prompted appropriate CAs across four baseline sessions was .023 CAs/min (range = 0 – 0.09/min). The only appropriate CA occurred during the final baseline session, when Ian repeated the name of a game card (“race”) after two confederates called it out. For Mathew, prompted appropriate CAs were at zero levels during all four baseline sessions.

**Intervention.** Ian’s prompted appropriate CAs increased to a mean of .47/min during intervention (range = 0.21 to 0.7/min). A slight decreasing trend in prompted CAs was mirrored by an increasing trend in spontaneous CAs, reflecting the fact that Ian’s communication became increasingly independent over the course of intervention. For Max, the rate of prompted appropriate CAs was highly variable throughout this phase, with a mean
of .53/min and a range of 0.22 to 0.74/min. Nonetheless, his rate was consistently higher than during baseline. The PND for prompted CAs was 100% for both Ian and Max, indicating a high level of change between baseline and intervention.

**Modes of Communication**

Communicative acts for both participants were coded to reflect the modes of communication they used: gestural, verbal, vocalization, or SGD.

**Ian.** Table 5 summarizes the proportion of total appropriate CAs for each mode of communication across baseline and intervention for Ian.

**Table 5. Percentages of appropriate communicative acts by modality during baseline and intervention for Ian**

<table>
<thead>
<tr>
<th>Modality</th>
<th>Baseline %</th>
<th>Intervention %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prompted</td>
<td>Spontaneous</td>
</tr>
<tr>
<td>SGD activation</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Gesture</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Verbal utterance</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Vocalization</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The only appropriate communicative act for Ian during baseline was a single verbal utterance. During intervention, SGD activations were the most common form of communication, with spontaneous CAs increasing to 63.4% and prompted CAs increasing to 33.6%. Prompted gestures increased from 0.0% in baseline to 1.0% in intervention, while prompted vocalizations remained at zero. Prompted verbal utterances decreased from 100% to 0.0% across phases; however, this represented only the single utterance that occurred
during baseline, Spontaneous verbal utterances increased to 2.0% during intervention, compared to 0.0% in baseline.

Although a high proportion of Ian’s spontaneous appropriate CAs were emitted via his SGD, it was important to examine the frequency with which he used individual messages, in order to accurately reflect the extent of communicative variability. The percentage of use for each phrase in his SGD was calculated by dividing the number of times he activated a phrase by the total number of phrases he produced during intervention. Table 6 summarizes the results.

**Table 6. Appropriate spontaneous SGD use by Ian during intervention**

<table>
<thead>
<tr>
<th>Phrase</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I need a marker</td>
<td>98.4</td>
</tr>
<tr>
<td>I pick the treat</td>
<td>1.6</td>
</tr>
</tbody>
</table>

For Ian, the most activated phrase (98.4%) was “I need a marker,” followed by “I pick the treat.” There was little variability in the content of his spontaneous SGD activations, overall.
Max. Table 7 summarizes the proportion of total appropriate CAs for each mode of communication across baseline and intervention for Max.

**Table 7. Percentages of appropriate communicative acts by modality during baseline and intervention for Max**

<table>
<thead>
<tr>
<th>Modality</th>
<th>Baseline %</th>
<th>Intervention %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prompted</td>
<td>Spontaneous</td>
</tr>
<tr>
<td>SGD activation</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Gesture</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Verbal utterance</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Vocalization</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Prompted SGD activations increased from 0% to 63.5% and spontaneous SGD activations increased from 0% to 31.7% between baseline and intervention. Max’s use of gestures and vocalizations showed no change across phases. Both spontaneous and prompted verbal utterances increased from 0% at baseline to 2.4% during intervention.

As was the case for Ian, the variability of spontaneous appropriate SGD activations during intervention was examined for Max by dividing the number of times he activated a phrase by the total number of phrases he produced. Table 8 displays the results.
Table 8. Appropriate spontaneous SGD use for Max during intervention

<table>
<thead>
<tr>
<th>Phrase</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t underestimate the force</td>
<td>42.5</td>
</tr>
<tr>
<td>You’re cheating</td>
<td>24.3</td>
</tr>
<tr>
<td>Give me a clue</td>
<td>6.2</td>
</tr>
<tr>
<td>Confederate’s name</td>
<td>6.0</td>
</tr>
<tr>
<td>My turn</td>
<td>3.0</td>
</tr>
<tr>
<td>How many do you have?</td>
<td>3.0</td>
</tr>
<tr>
<td>Your turn</td>
<td>3.0</td>
</tr>
<tr>
<td>Oh, oh, I know, I know</td>
<td>3.0</td>
</tr>
<tr>
<td>I have a bad feeling about this</td>
<td>3.0</td>
</tr>
<tr>
<td>May the force be with you</td>
<td>3.0</td>
</tr>
<tr>
<td>Max</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Max’s SGD activations were much more varied than Ian’s, with a total of 11 messages (including two confederate’s names) used during intervention. The most frequent message was “Don’t underestimate the force,” (42.5%) followed by “You’re cheating” (24.3%).
**Inappropriate Spontaneous SGD Use**

While the emphasis in this study was on appropriate CAs, both participants did occasionally emit inappropriate CAs (i.e., CAs that were contextually inappropriate), especially in the form of SGD activations. Data related to inappropriate spontaneous SGD use is displayed in Table 9 for both Ian and Max.

**Table 9. Rate per minute of inappropriate spontaneous SGD use across baseline and intervention for both participants**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline M (range)</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ian</td>
<td>0.08 (0 – 0.33)</td>
<td>0.02 (0 – 0.08)</td>
</tr>
<tr>
<td>Max</td>
<td>0.44 (0.08 – 0.87)</td>
<td>0.16 (0 – 0.33)</td>
</tr>
</tbody>
</table>

Ian’s rate of inappropriate spontaneous SGD use was very low during baseline ($M = .08/\text{min}$) and decreased during intervention ($M = .02/\text{min}$). Max had higher rates of inappropriate SGD use during baseline ($M = .44/\text{min}$) but this decreased considerably during intervention ($M = .16/\text{min}$). Both participants ended the study with lower rates of inappropriate spontaneous SGD use compared to baseline.

**Generalization**

Generalization probes were conducted at the beginning and near the end of the study for each participant. Results from the probes are shown in Table 10 for Ian and Table 11 for Max.
Table 10. Rate per minute of initiations and responses during generalization probes for

Mia

<table>
<thead>
<tr>
<th>Communicative Acts</th>
<th>Probe 1</th>
<th>Probe 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiations by Mia</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Responses by Mia</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Initiations to Mia by peers</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Responses to Mia by peers</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Initiations to Mia by confederates</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Responses to Mia by confederates</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Mia’s first generalization probe during baseline showed no initiations or responses either to or from peers or confederates. During the second probe during intervention, Mia’s peers initiated social interactions at a rate of 0.3 per minute and Mia’s responses increased to a rate of 0.1 per minute.

Table 11. Rate per minute of initiations and responses during generalization probes for

Max

<table>
<thead>
<tr>
<th>Communicative Acts</th>
<th>Probe 1</th>
<th>Probe 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiations by Max</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Responses by Max</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Initiations to Max by peers</td>
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<td>0.1</td>
</tr>
<tr>
<td>Responses to Max by peers</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Initiations to Max by confederates</td>
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<td>0.8</td>
</tr>
<tr>
<td>Responses to Max by confederates</td>
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<td>0.0</td>
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</table>
Max’s first generalization probe during baseline showed no initiations or responses either to or from peers or confederates. Max’s initiations increased during probe 2 of intervention to 0.3 initiations/minute. Initiations and responses by peers also increased to 0.1/min, and there was a dramatic increase in initiations by confederates (0.8/min).

**Social Validity**

All six confederates (three for each participant) were asked to complete social validity questionnaires at the end of the study. Likert-type scores ranged from 0 (not at all) to 5 (very much). Table 12 summarizes the means and ranges of the results.

**Table 12. Social validity scores from Ian’s and Max’s confederates**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean (range) for Ian</th>
<th>Mean (range) for Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>I liked participating in the play activities/games.</td>
<td>4.67 (4 – 5)</td>
<td>4.67 (4 – 5)</td>
</tr>
<tr>
<td>I feel good that I can show my classmate with autism how to use his/her talking computer.</td>
<td>4 (3 – 5)</td>
<td>4.33 (4 - 5)</td>
</tr>
<tr>
<td>I think this helped my classmate with autism to play with other kids in the class.</td>
<td>3.67 (3 – 5)</td>
<td>4.67 (4 – 5)</td>
</tr>
<tr>
<td>I would participate in activities like this again in the future.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>I feel like I made new friends by participating in the play activities/games.</td>
<td>3 (2 – 4)</td>
<td>3 (1 – 5)</td>
</tr>
</tbody>
</table>
Both Ian’s and Max’s confederates indicated that they liked participating in the games and would like to participate in activities of this nature again in the future. Both groups of confederates also indicated they felt good that they could show their classmate with autism how to use his SGD. Ian’s confederates were less confident than Max’s that the intervention helped him to play with other kids in the class. Confederates for neither Ian nor Max believed that they made new friends by participating in the study.
CHAPTER 4: Discussion

This study employed a multiple baseline design to determine the effectiveness of a peer-mediated intervention to support communication by students with ASD who used SGDs during social games. Results indicate that peers were successfully trained to support SGD use by their classmates with ASD. Although a functional relationship was not unequivocally established between peer-mediated support during social game routines and an increase in spontaneous appropriate CAs, visual analysis of the data provided suggestive evidence in support of the intervention. In addition, social validity ratings by the confederates of both participants were high, and generalization probes showed slight increases in interactions with classmates in non-experimental settings. This is only the second study to investigate the use of peer-mediated aided language modeling to promote SGD use for social interaction in natural contexts (e.g., play activities) (see Trembath et al., 2009). It is the first study to control for the type of play activities, to measure the spontaneity and appropriateness of communicative acts, and to involve school-age children.

Confederate Training

Research indicates that training typically developing peers can be effective for teaching social interaction skills to children with ASD (Harper et al., 2008; Odom & Strain, 1986; Strain et al., 1979; Strain et al., 1977; Thiemann & Goldstein, 2004). In this study, confederates were successfully trained to support SGD use by participants with ASD during social games. Overall, between 7-9 training sessions were required to accomplish this; training of Ian’s confederates required two more sessions than training of Max’s. This occurred because the facilitator allowed Ian’s confederates extra time to adjust to playing the game and use the SGD during the first two training sessions (sessions 5 and 6) and did not
prompt them as vigorously as possible as a result. The facilitator subsequently realized that this adjustment time was not needed, and proceeded to prompt Max’s confederates at high levels beginning with the first session of training.

Overall, training (including the initial SGD orientation session) required a total of 130 minutes for Ian and 96 minutes for Max. This corresponds favorably to previous peer-mediated intervention studies in which peer training ranged from approximately 40 to 150 minutes (Harper et al., 2008; Odom & Watts, 1991; Strain et al., 1979; Thiemann & Goldstein, 2004). This modest investment of time resulted in confederates’ ability to maintain high levels of virtually independent prompting throughout the intervention phase, where they required one facilitator prompt or less per 5 minutes in order to support communication by their classmates with ASD. The sole exception occurred for Ian during session 17, the first session after a 2-week Christmas break, when his confederates required facilitator prompting at a rate of 0.38 prompts/minute (i.e., approximately one prompt per 3 minutes). After this “refresher” session, the facilitator was able to return to intervention levels of prompting. A “refresher” session was not required by Max’s confederates following the Christmas break, perhaps because they were still in the training phase and had been receiving higher levels of prompting from the facilitator prior to it. For both Ian and Max, the facilitator was able to fade herself out completely during the last two intervention sessions and the confederates were able to prompt participants with no support whatsoever.

In general, the prompts delivered by the confederates were very effective across both training and intervention, with only a single prompt required for 80% or more of all prompted CAs. For Max, prompt effectiveness increased somewhat during intervention, but for Ian the opposite trend occurred. The proportion of effective prompts to Ian may have
decreased for two reasons. First, Ian displayed frequent self-stimulatory behaviours that differed in frequency and topography from session-to-session and that often caused him to disengage from the game for brief periods of time. Although data on the frequency of these behaviours were not recorded, Ian may have experienced more “high stim” days during intervention and may have required more repeated prompting from confederates as a result. Second, Ian’s confederates were very eager to prompt him during training, and many of the facilitator’s prompts to them during this phase involved reminders to “wait it out” (i.e., provide a 2-5 second time delay) in order to give Ian time to make an SGD activation. During intervention, when the facilitator provided very few conferee prompts, the peers sometimes failed to “wait it out” and provided more than one prompt to Ian in rapid succession. In contrast, prompt effectiveness by Max’s confederates increased during intervention. As Max became more involved in the game toward the end of training and during some of the intervention sessions, fewer conferee prompts were required to assist him to communicate.

During intervention, the rate of conferee prompts was generally stable for Ian but was highly variable for Max. This was related to the fact that, during some intervention sessions (sessions 24 and 27), Max engaged in high rates of problem behaviour concerning game play. He thoroughly enjoyed “cheating” by stealing cards from the card stack to create matching pairs during both his turn and peers’ turns, because such cheating resulted in increased positive social attention from peers (and, initially, from both the researcher and the facilitator as well). On days when Max engaged in high rates of such attention-motivated problem behaviour, his rate of spontaneous CAs was also higher as he activated “You’re cheating” on his SGD independently and required fewer conferee prompts. Unfortunately,
Max’s cheating interfered considerably with game play and so -- despite the fact that cheating was associated with less confederate prompting and more spontaneous SGD activation by Max -- it had to be curtailed. This issue is discussed further in the next section.

**Intervention**

The rules of evidence in single subject research require a minimum of three demonstrations of the experimental effect at three different points in time across different participants (Horner et al., 2005). Because only two participants were involved in this study, it was not possible to verify an unequivocal functional relationship between peer-mediated support during social game routines and an increase in spontaneous appropriate CAs by participants with ASD. However, a number of measures are suggestive of intervention effectiveness. First, there was an immediate increase in spontaneous appropriate CAs during intervention for Ian, with a PND of 100%; and an increase in appropriate spontaneous CAs by the second intervention session for Max, with a PND of 80%. During intervention, Ian’s spontaneous SGD activations increased from zero during baseline to 63%, and Max’s spontaneous SGD activations increased from zero during baseline to 31.7%. Together, these data indicate a fair to high level of change between baseline and intervention. Second, although Max’s SGD activations were much more varied than Ian’s, both boys activated more than one message appropriately on their SGDs, compared to zero during baseline. Third, the rate on inappropriate spontaneous SGD activations decreased for both participants during baseline and intervention. Thus, change for all measures was in the desired direction, suggesting a functional relationship. Detailed discussions of these elements are provided in the sections that follow.
**Ian.** During intervention, Ian’s communication followed the anticipated pattern in that, as prompted appropriate CAs gradually decreased, spontaneous appropriate CAs increased. Even after a 2-week hiatus for Christmas break, Ian was able to maintain high rates of spontaneous CAs, executed primarily using his SGD.

**Max.** For Max, the rate of spontaneous CAs was highly variable. As described previously, Max engaged in considerable attention-motivated problem behaviour during some sessions, beginning with session 20 (training). He began cheating (i.e., taking cards out of turn) during this session, and was reinforced by positive attention (e.g., laughter) from his confederates when he spontaneously activated the “no cheating” button on his SGD. Cheating behaviour continued to occur over subsequent training sessions until, in session 23 (the first intervention session), the game cards were placed out of Max’s immediate reach because his behavior was interfering with game play. Although this change reduced Max’s attempts to cheat, it also resulted in a decrease in CAs to baseline levels in session 23, presumably because he was less motivated to engage in the communicative interactions required for appropriate game play, which produced less frequent and lower quality social attention from his peers. In session 24, the Star Wars cards were again moved closer to Max, and he again began to cheat and to activate the “you’re cheating” message on this device. Because his behaviour continued to interfere with game play, his confederates were instructed (in session 25) to ignore Max when he cheated and to look for opportunities to reinforce appropriate game play instead. This again resulted in a decrease in problem behaviour as well as a dramatic decrease in the rate of CAs. It was apparent that social reinforcement from peers in the form of statements such as “thanks for waiting your turn, Max,” was simply not equivalent to the reaction Max received for his problem behaviour,
and thus failed to maintain his motivation to communicate and the high rate of associated CAs.

In order to provide Max with a more appropriate (i.e., non-cheating) way to obtain social attention from the confederates, Max’s SGD was programmed with additional Star-Wars-related messages beginning in session 26, including, “I have you now,” “I have a bad feeling about this,” “May the force be with you,” “Don’t underestimate the force” and “Let the Wookie win.” These messages were selected with the hope that they would generate a positive reaction from peers (e.g., laughter), similar to the reaction they produced when Max activated the “you’re cheating” message. However, in session 26, the messages failed to produce the anticipated reaction and Max’s CAs remained at a low rate. In session 27, the same messages were reprogrammed into the SGD using exaggerated intonation and pitch, and the facilitator provided a model to the confederates by laughing when Max activated any of these new messages. The combination of these changes was sufficient to produce the desired social reaction from the confederates and Max’s rate of CAs again increased as a result. Unfortunately, due to time constraints in Max’s school, the study had to be terminated following this session.

Despite the variability in the rate of Max’s spontaneous CAs, his percentage of non-overlapping data (PND) was 80% and Ian’s was 100%, indicating a fair to high level of change as a result of the intervention (Scruggs et al., 1986). Regarding prompted communication, the PND was 100% for both participants, indicating high level of change over baseline due to intervention. Thus, despite the interference caused by problem behaviors, the current intervention appeared to be fairly to highly effective at increasing appropriate prompted and spontaneous CAs during social games for both Ian and Max.
Communication Modalities

SGD activations were, by far, the most prevalent form of appropriate communication during intervention for both participants. This was in contrast to baseline, when Ian primarily communicated through a few prompted verbal utterances and Max engaged in no appropriate CAs at all. Ian also displayed low rates of prompted gestures and spontaneous verbal utterances during intervention, while Max’s communication expanded to include both spontaneous and prompted verbal utterances during this phase. While the confederates were instructed to prompt SGD use, it is important to acknowledge the communicative contributions of other modalities as well. Previous research suggests that AAC may enhance overall rates of communication (including gestures, verbalization, and vocalizations), as found in this study (Millar, 2009; Schepis et al., 1998).

In addition to the modalities used for spontaneous, appropriate CAs, the content of these CAs also were examined. For Ian, 91% of appropriate spontaneous CAs consisted of the message “I need a marker,” which was required every time one of the squares on his bingo card matched a picture that was drawn from the pile. This was the first spontaneous SGD activation Ian acquired during training, and it continued to remain the most prevalent during intervention. A number of researchers have suggested that children with ASD learn to communicate wants and needs prior to learning to communicate messages that result in less concrete outcomes, such as those used to attract attention or make comments about ongoing activities (Stone & Caro-Martinez, 1990; Wetherby, 1986; Wetherby, Yonclas, & Bryan, 1989). At the onset of the intervention phase, Ian was still in the process of learning to request items using his SGD, and the phrase “I need a marker” was the only request programmed into his device. Thus, it was logical that he learned to use this message before
the other, more social messages that were available to him. In retrospect, given his level of concrete language development and his excellent matching skills, Ian might have benefited from having the names of the individual bingo pictures programmed in his device as well. Had that been the case, he would have had opportunities to activate a matching message on his SGD every time a card was pulled, in order to “call out” the picture name (e.g., “Do you have a slide?,” “Do you have a swing?”). This would have provided him with up to 25 additional communicative opportunities (the number of pictures on each bingo card) during each session.

In contrast, Max preferred to use his SGD for social interaction rather than to communicate wants and needs during the study. As discussed previously, his most frequently-used phrases included, “Don’t underestimate the force,” and “You’re cheating,” both of which elicited social attention from his peers. This suggests that Max was at more advanced stage of language development than was Ian (Wetherby, 1989) and was thus more motivated to produce comments and attention-seeking messages. In fact, from the beginning of the study, Max was much more interested in pressing buttons on his SGD than was Ian, as indicated by his higher rate of inappropriate spontaneous CAs during baseline. Again in retrospect, a systematic pre-assessment of language and communication skills might have detected Max’s motivation to communicate socially and might have resulted in the selection of SGD messages that were more conducive to communication and less likely to result in problem behavior (e.g., “How am I doing?,” to elicit social feedback from peers during game play).
**Generalization**

Generalization probes were conducted at the beginning and near the end of the study for both participants, to examine the extent to which social interactions with their classmates would increase in non-experimental social settings (e.g., classroom recess) following intervention. During the first generalization probe, neither participant showed evidence of either initiations to the peers or confederates, or responses to their peers or the confederates. During the second generalization probe for Ian, there was a slight increase in initiations by peers and in responses by Ian. However, the peers seemed more intrigued by the novelty of Ian’s SGD during this probe than interested in interacting with Ian himself. Interactions during this generalization probe were not of high quality; a few peers called Ian’s name and one peer gave him a high-five to which he responded. Thus, it does not appear that the intervention was associated with generalization to the classroom setting for Ian.

During Max’s second generalization probe, there was an increase in initiations by Max, his peers, and the study confederates, as well as an increase in responses to Max by peers. Max initiated an interaction by using his device to say, “I like Star Wars,” and then (after a number of peers approached him) proceeded to play Star Wars-themed music on his computer while they watched. Later on, he initiated again to both peers and confederates by activating, “My name is Max.” This was in contrast to Max’s first generalization probe, during which he stood at the back of the classroom by himself. In addition, there was a dramatic increase in the rate of initiations by the study confederates during this probe; however, this was likely due, at least in part, to researcher reactivity. All three confederates showed visible signs of reactivity that included repeatedly looking at the researcher (who was videotaping the probe session). It appeared that her presence acted as a cue for them to
initiate interactions with Max by approaching him to ask about the types of songs he was playing on his computer and about his song preferences (i.e. “Do you like this song, Max?”). Max did not respond to these initiations.

Overall, numerous problems were encountered with the generalization probes. It was very difficult to schedule a time when the entire class was free for 10 minutes. The only options were to use a scheduled indoor recess time (which occurred only if it was raining outside); to require the peers, confederates, and participants to stay indoors during recess while the rest of the school was outside (which the classroom teachers were unwilling to do); or to sacrifice classroom work time in order to create the probe session (which the teachers were also unwilling to do). On several occasions, probe sessions were scheduled on days when it failed to rain, resulting in cancellations. In combination with time constraints, these factors limited the generalization to two probe sessions, although several additional probes would have been desirable. Additional research is also needed to examine the extent to which the results of peer-mediated SGD instruction generalizes across settings, materials and people. Training should also be delivered in a variety of settings (i.e. classroom, playground) using an assortment of games as a means of promoting generalization and maintenance.

**Social Validity**

All six confederates reported that they enjoyed participating in the study and said that they would be willing to participate in similar studies in the future. In addition, they all felt that the intervention helped Ian and Max learn to play with other kids in their classrooms, though Max’s confederates were less confident about this. Neither Ian’s nor Max’s confederates believed that they themselves made new friends by participating in the study; this may be because, as one confederate put it, “they were already my friends.” Nonetheless,
the confederates were generally positive about the intervention overall and their participation in it.

**Limitations and Future Research**

There were a number of limitations to the study, which constrained an unequivocal interpretation of experimental control. Only two children with ASD participated, which constrained assessment of experimental control. Only six confederates, who varied considerably in their ability to implement the intervention, were involved as well. Future research should replicate this study with a greater number of participants and confederates across a wider range of cognitive, social, and academic abilities.

Another limitation involved the selection of the games and messages that were programmed in to the SGDs. The concern related to messages was discussed previously in the Intervention section. Regarding the games themselves, an informal assessment to identify the types of games Ian and Max were able to play was conducted with each of their special education assistants and speech and language pathologists prior to the study. The Bingo and matching games used in the study were identified as appropriate from this assessment; however, in reality, both participants struggled to play the selected games independently. They required more gestural and physical prompting for game play from the facilitator than was anticipated at the study onset, and this may have compromised the rate of CAs as well. Future studies that utilize a game format to teach SGD use in a social context should conduct a thorough pre-assessment to insure that participants are fluent with the forms and types of games selected.

A third limitation involved the instructional techniques that were used during the study. During training, confederates were allowed to pass the SGD around from person-to-
person, to facilitate easy access. After training was complete, it would have been preferable to keep the SGD stationery on the table so that the participants could view every activation by their respective confederates, in line with the goal of providing aided language modeling. However, this did not occur until session 16 for Ian and session 25 for Max, because it proved to be very difficult for confederates to activate the device while keeping it stationary. This limited the extent to which aided language modeling was fully implemented. In future studies of peer-mediated SGD instruction, the SGD should be fastened to a fixed position from the outset so that participants can see all activations, even if this requires unusual seating arrangements in order to accommodate this requirement. In addition, the confederates did not always adhere to a strict least-to-most prompt hierarchy, although no data were available to assess fidelity in this regard. Nonetheless, when conferee prompts were required, they were effective at eliciting appropriate CAs over on average 88.9% of the time.

Implications for Practice

With a shortage of qualified school-based speech language pathologists (SLPs) who are available to serve children with ASD, it is imperative that the time spent to teach communication be both effective and efficient (ASHA, 2004). After a modest investment of time, six typically developing children were trained by an SLP to use an SGD and to implement teaching strategies that included prompting and time delay with classmates with ASD. Essentially, this study created six “mini-interventionists” who are now present in the same classrooms as the two participants with ASD, 6 hours a day for 5 days a week. While this study did not examine the extent to which the confederates were able to prompt and support SGD use outside of the intervention setting, the potential exists for this to occur. Since educational goals for children with ASD almost always target both communication and
social interaction, interventions focused on providing peer-mediated support in these two domains would seem to be especially valuable. This study provided preliminary evidence that peers are capable of taking on the role of teaching a child with ASD to use an SGD and that such instruction can result in positive communication outcomes.

**Conclusion**

Social interaction skills are crucial to child development and affect individuals well into adulthood. Children with ASD who use AAC are at risk for social skill deficits, and require intervention programs focused on developing these skills in the context of naturally occurring routines and environments. In the only other study to investigate this issue, Trembath et al. (2009) found that peer-mediated teaching using an SGD was functionally related to increases in communication by preschoolers with autism during play activities. In contrast to Trembath et al., however, this study provided a thorough examination of the communicative acts that were produced by the two participants, including evaluations of modality, spontaneity, and appropriateness. For example, unlike Trembath et al., this study distinguished between SGD activations that were contextually appropriate and those that were not. In addition, while neither study controlled for the number of prompts per session, this study included documentation of prompt frequency as part of the analysis. Such documentation provides a more comprehensive understanding of the training process and may contribute to future peer training studies.

The results of this study demonstrated that peers can learn to support SGD use in children with ASD who use SGDs and suggested that communication in social contexts can be positively affected as a result. Future research is required to investigate factors related to generalization across people, materials, and settings. Nonetheless, this study contributes to
the AAC literature by providing additional evidence that training peers is an effective and efficient way to promote communication in children with ASD who use SGDs.
REFERENCES


APPENDIX A

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - FULL BOARD

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<td>Nadine K. Trottler</td>
<td>Special Education Technology British Columbia</td>
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The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
Dr. Ken Craig, Chair
Dr. Jim Rupert, Associate Chair
Dr. Laurie Ford, Associate Chair
Dr. Daniel Salhani, Associate Chair
Dear Parent,

I am currently working towards my Masters of Arts Degree at the University of British Columbia in Special Education. I am interested in conducting a study to teach students with autism to use speech-generating devices (SGDs) to engage in social interactions with peers in school settings. SGDs are small, portable computers that “talk” when activated. They can be programmed to speak words, phrases, and/or sentences that are represented by pictures. They enable children who are unable to speak to communicate their wants, needs, thoughts, and feelings.

Ms. Lorraine Kamp, a speech-language pathologist who is associated with the Surrey School District, has identified your (son/daughter), name of child with autism, as being a potential candidate for this study because (he/she) has autism and uses an SGD. Participation for name of child with autism will involve playing with 3-4 other children in (his/her) class at school for approximately 15-20 minutes, two or three times per week for approximately 8 weeks. The activities in which the children participate will be interesting to all of them (for example, games, art projects, etc.). All of the sessions will occur during the daily silent reading time in your child’s classroom, so he or she will not miss any academic learning time. All sessions will be videotaped, and I will use these videotapes to record data on SGD use by your child.

There are no foreseeable risks to name of child with autism in this study. If name of child with autism indicates, through his/her behavior or by activating his/her SGD, a desire not to participate or to terminate a play session, this will occur immediately.

Potential benefits to name of child with autism include learning to use (his/her) SGD for social interactions with classmates. In addition, name of child with autism and (his/her) classmates may develop friendships with one another during the study and may be more able to engage in social interactions during additional activity settings following the study.

If you are interested in having your child participate in this research study, please read and sign the consent form that accompanies this letter, and return it to your child’s teacher. If you have any questions, you may contact me directly at __________ or __________; or you may contact my advisor, Dr. Pat Mirenda, at _______ or pat.mirenda@ubc.ca. Thank you for considering your child’s involvement in this project.

Respectfully,

Nadine Trottier
APPENDIX C

The University of British Columbia

Confederate Recruitment Letter

Dear Parent,

I am currently working towards my Masters of Arts Degree at the University of British Columbia in Special Education. I am interested in conducting a study to teach students with autism to use speech-generating devices (SGDs) to engage in social interactions with peers in school settings. SGDs are small, portable computers that “talk” when activated. They can be programmed to speak words, phrases, and/or sentences that are represented by pictures. They enable children who are unable to speak to communicate their wants, needs, thoughts, and feelings.

Ms. Lorraine Kamp, a speech-language pathologist who is associated with the Surrey School District, has identified your (son/daughter), name of potential confederate, as being a potential playmate for this study because (he/she) is a classmate of a child with autism and has no social, behavioral, or cognitive impairments. Participation for name of potential confederate will involve playing with a classmate with autism and 2-3 other children in your child’s class for approximately 15-20 minutes, two or three times per week for approximately 8 weeks at school. The activities in which the children participate will be interesting to all of them (for example, games, art projects, etc.). In addition, name of potential confederate will participate in two 30-minute training sessions to learn how to use the child’s SGD and to practice using it, with adult support. All of the sessions will occur during the daily silent reading time in your child’s classroom, so he or she will not miss any academic learning time. All sessions will be videotaped, and I will use these videotapes to record data on SGD use by the child with autism.

Since name of potential confederate will be interacting with a child with autism who may exhibit some unusual or disruptive behavior, there may be some risk. For example, your child may be exposed to a child who makes unusual noises, prefers to play games in specific ways, has a short attention span, flaps his or her hands, or engages in other body movements that are unusual but not harmful. However, two adults will be present at all times to ensure the safety of all of the children. In addition, if name of potential confederate or any other child indicates either verbally or through his/her behavior a desire to not participate or to terminate any session, it will be discontinued immediately.

Potential benefits to name of potential confederate include learning more about SGDs and learning how to interact productively with a classmate with autism. In addition, name of potential confederate and the child with autism may develop friendships with one another during the study and may be more able to engage in social interactions during additional activity settings following the study.
If you are interested in having your child participate in this research study, please read and sign the consent form that accompanies this letter. In addition, your child should sign the enclosed “assent form” to indicate that he or she is willing to participate. Please return BOTH forms to your child’s teacher within the next few days. If you have any questions, you may contact me directly at __________ or __________; or you may contact my advisor, Dr. Pat Mirenda, at __________ or pat.mirenda@ubc.ca. Thank you for considering your child’s involvement in this project.

Respectfully,

Nadine Trottier
APPENDIX D

The University of British Columbia

Informed Consent Form (Participant)
Promoting Social-Communicative Development in Students with Autism Who Use Augmentative and Alternative Communication (AAC)

Principal Investigator
Pat Mirenda, Ph.D., Professor (Faculty Advisor)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia

Co-investigator
Nadine Trottier, Graduate Student (Masters)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia
Research for the fulfillment of degree requirements for the Masters of Arts degree. Ms. Trottier will use the data from this project for her thesis (public document)

Purpose of the Study
The purpose of the study is to investigate the effects of an intervention designed to teach students with autism to use speech-generating devices (SGDs) to engage in social interactions with peers in school settings. Your child is eligible to participate because he or she has an autism spectrum disorder and uses an SGD at school.

Study Procedures and Time Commitment
The study will focus on teaching children with autism to use SGDs in social play situations. The intervention will involve adult-supported play sessions between your child and (his/her) typically developing peers. All sessions will be videotaped, and the investigator will use these videotapes to record data on your child’s SGD use.

During the study, your child and 3-4 typically developing peers from his or her classroom will engage in planned games or interactive activities (e.g., board games, art projects) with adult support, in a resource room in your child’s school. Ms. Lorraine Kamp, a speech-language pathologist associated with your child’s school, will prompt the peers to encourage SGD use by your child, using a variety of prompting methods. Ms. Kamp will fade all prompts gradually until the peers are able to support your child’s SGD use without adult assistance, during the play routines. All play sessions will be conducted during silent reading time to avoid missing classroom teaching time. In addition, your child will be videotaped during an unstructured play time in (his/her) classroom before and after the intervention, to see if the training had an effect on classroom interactions.

Your child will participate in 2-3 sessions (15-20 minutes each) per week, over approximately 8 weeks. The intervention phase of the study may be longer or shorter in
duration, depending on the length of time required to teach peers to prompt your child’s SGD use without Ms. Kamp’s assistance. The total time commitment is estimated at 4-8 hours over a 2-month period for your child. There are no foreseeable risks to your child in this study. An adult will be present at all times to insure the safety of all of the children. If your child indicates, through his/her behavior or by activating his/her SGD, a desire not to participate in play sessions or to terminate a session, this will occur immediately. Potential benefits to your child include learning to use (his/her) using their SGD for social interactions with classmates. In addition, your child and his/her peers may develop friendships with one another during the study and may be more able to engage in social interactions during additional activity settings following the study.

Confidentiality
All information from this research study will be kept strictly confidential. Your child will not be identified by name in any reports of the completed study. All data records and videotapes will be kept on a password-protected computer disk or in a locked file cabinet and destroyed 5 years after the end of the study. Only the principal investigator, the co-investigator, and one research assistant will have access to the data. Videotaped material will not be used in any presentations with your permission.

Contact
If you have any questions or would like more information about this project, you may contact either Nadine Trotter at _________ or Dr. Pat Mirenda _________. If you have any concerns about your child’s treatment or rights as a research participant, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598 or if long distance e-mail to RSIL@ors.ubc.ca

Consent
I understand that my child’s participation in this study is entirely voluntary. I may refuse to have him/her participate or withdraw from the study at any time without jeopardy to my current or future relationship with the Surrey School District or the University of British Columbia.

Please check ✔ below:
☐ I have received a copy of the consent form.

Please check ✔ one box below:
☐ I consent to my child’s participation in this study.
☐ I do not consent to my child’s participation in this study.
If you consent to having your child participate in this study, please print your child’s name, print your name, and sign the appropriate section below.

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<th>Child’s name (please print)</th>
<th>Date</th>
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<tr>
<td>Parent/Guardian’s name (please print)</td>
<td>Date</td>
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<td>Parent/Guardian’s signature</td>
<td>Date</td>
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APPENDIX E

The University of British Columbia

Informed Consent Form (Confederate)
Promoting Social-Communicative Development in Students with Autism Who Use Augmentative and Alternative Communication (AAC)

Principal Investigator
Pat Mirenda, Ph.D., Professor (Faculty Advisor)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia

Co-investigator
Nadine Trottier, Graduate Student (Masters)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia
Research for the fulfillment of degree requirements for the Masters of Arts degree. Ms. Trottier will use the data from this project for her thesis (public document)

Purpose of the Study
The purpose of the study is to investigate the effects of an intervention designed to teach students with autism to use speech-generating devices (SGDs) to engage in social interactions with peers in school settings. Your child is eligible to participate because he or she is a classmate of a child with autism and has no social, behavioral, or cognitive impairments.

Study Procedures and Time Commitment
The study will focus on teaching children with autism to use SGDs in social play situations. The intervention will involve adult-supported play sessions between your child, 2-3 of (his/her) classmates, and a classmate with autism. All sessions will be videotaped, and the investigator will use these videotapes to record data on SGD use by the child with autism.

In the first phase of the study, two 30-minute SGD orientation sessions will be conducted with your child and other selected peers by Ms. Lorraine Kamp, a speech-language pathologist associated with the Surrey School District. During these sessions, your child will be taught how to use a classmate’s SGD and will have opportunities to practice using it, with feedback. Your child will also be provided with basic information about how to help (his/her) classmate with autism use the SGD to communicate and how to respond when he/she does so.

In the second phase of the study, a child with autism, your child, and 2-3 other typically developing peers from (his/her) classroom will engage in planned games or interactive activities (e.g., board games, art projects) in a resource room in your child’s school, under the
supervision of Ms. Kamp. Ms. Kamp will prompt your child and other peers to encourage SGD use by the child with autism, using a variety of prompting methods. Ms. Kamp will then fade all prompts gradually until your child and the other peers are able to support the child with autism to use (his/her) SGD without adult assistance, during the play routines. All of the play sessions will be conducted during silent reading time in your child’s classroom, to avoid missing academic teaching time.

Your child will participate in 2-3 sessions (15-20 minutes each) per week, over approximately 8 weeks. In addition, your child will also participate in two additional 30-minute sessions for SGD orientation. The intervention phase of the study may be longer or shorter in duration, depending on the length of time required to teach peers to prompt SGD use without facilitator assistance. The total time commitment is estimated at 5-9 hours over a 2-month period for your child.

There are potential risks to your child because of exposure to a child who has autism. Depending on the specific characteristics of the child with autism, these risks may include exposure to a child who makes unusual noises, prefers to play games in specific ways, has a short attention span, flaps his or her hands, or engages in other unusual body movements that are not harmful. An adult will be present at all times to insure the safety of all of the children. If your child indicates a desire not to participate in a play session or to terminate a session, this will occur immediately. If you or your child choose to withdraw from the study at any time, another peer will be selected by Ms. Kamp to replace (him/her).

Potential benefits to the child with autism include learning to use (his/her) SGD for social interactions with classmates. Potential benefits to your child include learning more about SGD's and learning how to interact productively with a classmate with autism. In addition, your child and the child with autism may develop friendships with one another during the study and may be more able to engage in social interactions during additional activity settings following the study.

Confidentiality
All information from this research study will be kept strictly confidential. Your child will not be identified by name in any reports of the completed study. All data records will be kept on a password-protected computer disk or in a locked file cabinet and destroyed 5 years after the end of the study. Only the principal investigator, the co-investigator, and one research assistant will have access to the data. Videotaped material will not be used in any presentations with your permission.

Contact
If you have any questions or would like more information about this project you may contact either Nadine Trottier at _________ or Dr. Pat Mirenda, _______. If you have any concerns about your child’s treatment or rights as a research participant you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598 or if long distance e-mail to RSIL@ors.ubc.ca.

Consent
I understand that my child’s participation in this study is entirely voluntary. I may refuse to have him/her participate or withdraw from the study at any time without jeopardy to my
current or future relationship with the Surrey School District or the University of British Columbia.

Please check ✓ below:

☐ I have received a copy of the consent form.

Please check ✓ one box below:

☐ I consent to my child’s participation in this study.
☐ I do not consent to my child’s participation in this study.

If you consent to having your child participate in this study, please print your child’s name, print your name, and sign the appropriate sections below.

________________________________________          __________________________
Child’s name (please print)                                Date

________________________________________          __________________________
Parent/Guardian’s name (please print)                                Date

________________________________________          __________________________
Parent/Guardian’s signature                                  Date
APPENDIX F

Surrey School District
Surrey Schools...Keeping Learners at the Centre

Research Project

A student in your child’s classroom will be involved in a project conducted by researchers from the University of British Columbia sometime during this school year. Part of the project will require the student to be videotaped at school during play or free time activities with classmates. Your permission is requested to allow your child to be videotaped if he or she plays or interacts with the research child at school during the videotaping period. Your child’s full name will not be used during videotaping and your child will not miss any learning activities as a result. No one except the researchers will see the videotapes. Your child will only be videotaped if he or she engages in positive interactions with the target child.

I give my consent for the child named below to be videotaped during the research study.

I do not give my consent for the child named below to be videotaped during the research study.

Your child’s name:______________________________

Parent / Guardian Signature ___________________________ Date ___________________________
APPENDIX G

The University of British Columbia

Informed Assent Form (Confederate)
Promoting Social-Communicative Development in Students with Autism Who Use Augmentative and Alternative Communication (AAC)

Principal Investigator
Pat Mirenda, Ph.D., Professor (Faculty Advisor)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia

Co-investigator
Nadine Trottier, Graduate Student (Masters)
Department of Educational & Counseling Psychology, and Special Education (ECPS)
Faculty of Education, University of British Columbia
Research for the fulfillment of degree requirements for the Masters of Arts degree. Ms. Trottier will use the data from this project for her thesis (public document)

Purpose of the Study
This study is going to teach me how to help a classmate with autism use a talking computer to play with me and other kids.

Study Procedures and Time Commitment
During the study, me and some other kids will play fun games or activities during silent reading time at school, a few times each week. The games and activities will be planned and led by an adult (Ms. Kamp). When we play, Ms. Kamp will show us how to help a classmate with autism use a talking computer. Someone will videotape my classmates and me when we play these games and activities, as well as before and after the study in my classroom. There will be 2-3 play sessions (15-20 minutes each) per week, for around 8 weeks.

During the study, an adult will always be there to make sure that I am safe and to answer any questions I might have. If I don’t feel like playing a game or activity, I will tell Ms. Kamp and she will let me go back to my classroom on that day. I might learn how to help my classmate with autism use a talking computer and I might also make new friends during the study.

Confidentiality
No one except for the researchers will see the videotapes of my classmates and me playing together.
Contact
If I have any questions or worries about what is happening during the study, I will ask my mom or dad, Ms. Kamp, or the person who is videotaping during the study.

Consent
It’s up to me to decide if I want to participate in this study. If I decide that I don’t want to participate any more, I will tell my parents or Ms. Kamp and they will find someone else to do this. It’s okay if I change my mind.

Please check ✓ below:
☐ I have read this or someone has read this to me and I understand what it says. My mom or dad has a copy of this form.

Please check ✓ one box below:
☐ I want to be in this study.
☐ I do not want to be in this study.

________________________________________________________________________
Child’s name (please print) Date

________________________________________________________________________
Child’s signature Date
## APPENDIX H

<table>
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<tr>
<th>Communicative Acts</th>
<th>Independence</th>
<th>Appropriateness</th>
<th>Peer Prompts</th>
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<tr>
<td>SA = SGD activation</td>
<td></td>
<td>A = Appropriate</td>
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<tr>
<td>G = Gesture</td>
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<td>I = Inappropriate</td>
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<tr>
<td>V = Vocalization</td>
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<td>VU = Verbal Utterance</td>
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<td>Type</td>
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<td>P = prompted</td>
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## APPENDIX I

Generalization Data Collection

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<thead>
<tr>
<th>Initiations</th>
<th>Responses</th>
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<tbody>
<tr>
<td><strong>P = peers</strong></td>
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<tr>
<td><strong>C = confederates</strong></td>
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<tr>
<td><strong>PP = participants</strong></td>
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APPENDIX J

Training & Intervention Implementation Checklist

Date: ____________________________

☐ Sets up play group materials on the table.

☐ Puts SGD on the right page, with the volume turned up and in front of participants and/or confederates.

☐ Provides feedback regarding performance during previous play sessions.

☐ Establishes rules for the games/activity OR N/A (not required after the first few sessions).

☐ Chooses a player to start.

☐ TRAINING: Prompts confederates (within 10 seconds) to encourage SGD use by the participants (when needed).

INTERVENTION: Waits 5 – 15 seconds and then prompts confederates to encourage SGD use by the participants (when needed).

☐ TRAINING: Prompts confederates (within 10 seconds) to use the SGD themselves to interact throughout the play activity (when needed).

INTERVENTION: Waits 5 – 15 seconds and then prompts confederates to use the SGD themselves to interact throughout the play activity (when needed).

☐ Prompts using a hierarchy of verbal, gestural, and physical prompts

☐ Does not prompt participants during the play activity, unless required for game play.

☐ Allows the game to continue until the natural end point (someone gets BINGO or all matching pairs have been selected).

☐ Provides edible reinforcement to participants and confederates.

☐ Dismisses confederates and cleans up materials.
APPENDIX K

Social Validity Measure

Date: ____________  Name: ____________________

1. I liked participating in the play activities/games.

   0  1  2  3  4  5
   Not at all  Very much

2. I feel good that I can show my classmate with autism how to use his/her talking computer.

   0  1  2  3  4  5
   Not at all  Very much

3. I think this helped my classmate with autism to play with other kids in the class.

   0  1  2  3  4  5
   Not at all  Very much

4. I would participate in activities like this again in the future.

   0  1  2  3  4  5
   Not at all  Very much

5. I feel like I made new friends by participating in the play activities/games.

   0  1  2  3  4  5
   Not at all  Very much