Replacing Prelinguistic Behaviors with Functional Communication

Deb Keen
Fred and Eleanor Schonell Special Education Research Centre
The University of Queensland

Jeff Sigafoos
Faculty of Education, The University of Sydney
and
Children’s Hospital Education Research Institute (CHERI)

Gail Woodyatt
Department of Speech Pathology and Audiology
The University of Queensland

MANUSCRIPT SUBMITTED FOR PUBLICATION, MAY 1999, TO THE
JOURNAL OF AUTISM AND DEVELOPMENTAL DISORDERS

Preparation of this manuscript was supported in part by a grant from the Australian Research Council. The paper is based in part on the Ph.D. work of the first author at The University of Queensland. Address correspondence to Jeff Sigafoos, Faculty of Education, Bldg. A35, The University of Sydney, Sydney, NSW 2006, Australia.
Abstract
This study evaluated the effectiveness of a teacher-implemented intervention package designed to replace prelinguistic behaviors with functional communication. Four young children with autism participated in a multiple-baseline design across three communicative functions. Initially, three existing communication functions were described for each child. Next, the existing prelinguistic behaviors that the children used to achieve these functions were identified. Replacement forms that were more recognizable and symbolic were defined to achieve these same functions. After a baseline phase, teachers received inservice training, consultation, and feedback on how to encourage, acknowledge, and respond to the replacement forms. During intervention, the replacement forms increased and prelinguistic behaviors decreased in most cases. The results demonstrated the effectiveness of functional communication training to replace prelinguistic behaviors with more appropriate forms of communication.

KEY WORDS: prelinguistic behaviors, functional communication training, autism
Replacing Prelinguistic Behaviors with Functional Communication

Deficits in functional communication are defining characteristics of autism (American Psychiatric Association, 1994). Intervention to develop functional communication is therefore a priority in the education of children with autism. Roughly 50% of children with autism fail to develop speech (Wetherby & Prizant, 1992). In the absence of speech and acquisition of augmentative and alternative communication (AAC), these children may rely on idiosyncratic, informal, or problematic behaviors to communicate. Such behaviors are often referred to as nonsymbolic or prelinguistic communication. Prelinguistic communicative acts include pointing and reaching for desired objects. Children with autism may also often lead and guide another to perform some action, such as when the child guides the parent’s hand to the cookie jar in an attempt to access the contents (Carr & Kemp, 1989). Other forms of prelinguistic communication include informal gestures, facial expressions, body movements, gaze, and vocalizations (Siegel-Causey & Guess, 1989). In addition, some children may engage in problem behaviors, such as aggression, self-injury, and tantrums to communicate (Carr & Durand, 1985).

Young children without disabilities may rely on some similar forms of prelinguistic actions (e.g., reaching, vocalizing, body movements, tantrums) to communicate during early development and prior to the emergence of more symbolic communication (e.g., formal gestures, speech). However, children with autism often fail to develop more symbolic forms of communication in the absence of systematic instruction. As a result these children may continue to rely on prelinguistic actions to communicate.
Reliance on prelinguistic forms may be problematic for some children with autism. Some forms such as aggression and self-injury are clearly inappropriate (Carr & Durand, 1985). Other prelinguistic forms may be acceptable forms of communication and should be encouraged (Siegel-Causey & Guess, 1989). However, if the prelinguistic forms are highly idiosyncratic or subtle, they may be difficult for the communicative partner to recognize and interpret. For example, a child who flaps their hands when offered an object may be indicating a request or rejecting the offer. There may be value, therefore, in replacing these prelinguistic forms with actions that are easier for the communicative partner to recognize and interpret.

Functional communication training (FCT) has been used to replace challenging behavior with more appropriate forms of communication (Durand, 1993; Durand & Carr, 1991). Typically, a functional assessment is conducted to identify the communicative function of the problem behavior. Next, a functionally equivalent and socially acceptable form of communication, such as the use of manual signs or a picture-based communication board, is identified and targeted for intervention. Studies have shown that as the individual acquires the alternative form of communication, there is typically a collateral decrease in challenging behavior (Mirenda, 1997).

In this study, we sought to evaluate a variation of FCT to replace prelinguistic behaviors with more recognizable, conventional, and symbolic forms of communication. Three communication functions were selected for each child. The existing prelinguistic behaviors that the child used to indicate each of these three communicative functions were identified through a pre-intervention assessment. More
conventional and symbolic communicative responses for each function were then targeted for intervention.

Method

Participants

Four children participated in the study. All had a diagnosis of autism, lived at home with their families, and attended an educational program on a part-time basis. Descriptive data for each child are presented in Table 1.

Teachers used the second edition of the Receptive-Expressive Emergent Language Scale (REEL-2) (Bzoch & League, 1991) to assess language ability. This device is a developmental checklist for infants and toddlers up to 3 years of age. It was considered appropriate for the children in this sample because of the severe nature of their communication impairment. Expressive language ages for the participants ranged from 4 to 6 months with a mean of 5.25 months. Receptive language ages ranged from 5 to 9 months with a mean of 6.5 months.

Teachers also completed the TARC Assessment System (Sailor & Mix, 1975) to assess self-help, motor, communication, and social skills. Subscale scores for each of these skill areas were calculated together with an overall standard score, with a mean of 50 and a standard deviation of 20. The device is based on a sample of 283 children with severe disabilities from 3 to 16 years of age. Overall standard scores for the four participants in this study ranged from 17 to 43, indicating that all four children had substantial deficits in adaptive behavior. Teachers also used the
Replacing Prelinguistic Behaviors

Developmental Behaviour Checklist (DBC) (Einfeld & Tonge, 1994) to assess the children’s severity of emotional and behavioral disturbance. Percentile rankings for these children ranged from the 73rd to 97th percentile indicating severe levels of emotional and behavioral disturbance in all four children.

Settings and Identification of Communicative Functions

Communicative functions were chosen in consultation with teachers, based on a prior assessment using the Inventory of Potential Communicative Acts (IPCA) (Sigafoos et al., in press). The IPCA is an interview schedule that is designed to identify prelinguistic behaviors of children with developmental and physical disabilities who have severe communication impairment. It requires the informant to indicate how the child communicates 10 distinct communicative functions. This information is summarized to give an overview of the child’s range of communicative forms and functions. Naturalistic observations and structured assessments were subsequently conducted to verify information obtained from the IPCA. For the naturalistic observations, three activities (e.g., snack time, small-group instruction, and toy play) were chosen for each child and 90 min of videotape was analyzed to obtain information of the child’s use of prelinguistic behaviors. Structured assessments involved presenting each child with 10 opportunities to use an identified communicative function within a specified activity. For example, a child might be offered two toys and asked which toy they wanted to assess prelinguistic choice making abilities. Communicative functions chosen for intervention in the present study were identified by the teacher in the IPCA and verified as present in the child’s repertoire through naturalistic observations, structured observations or both.
Intervention was conducted in each child’s classroom. Baseline and intervention occurred at times when opportunities for selected communicative functions would occur normally. These varied for each child and are summarized in Table 2.

Ian and Patrick attended the same preschool class with two other children. For Ian, the three communicative functions chosen for intervention were (a) requesting food, (b) making a choice between two toys, and (c) requesting a turn with a toy or activity. Requesting food took place during afternoon snack time, making a choice occurred during toy play, and requesting a turn occurred during small group learning sessions involving pre-academic activities such as blowing bubbles. The communicative functions chosen for Patrick were (a) requesting food, (b) making a choice between two toys, and (c) requesting a turn at a preferred leisure activity. Data were recorded during afternoon snack time, toy play, and group sessions.

Beth attended a preschool class for 12 children with developmental disabilities. Her three communicative functions were (a) requesting food, (b) making a choice between two toys, and (c) requesting a turn. Baseline and intervention data were recorded during morning snack time, toy play, and a small group learning session. Dave attended a classroom with four other children with autism. His communicative functions were (a) greeting, (b) choice making, and (c) requesting food. The three activities selected for baseline and intervention were a social skills
Replacing Prelinguistic Behaviors

training program conducted in a small group, a toy play session, and morning snack time.

Experimental Design

The study included baseline and intervention phases arranged in a multiple-probe across behaviors design (Horner & Baer, 1978). For each child, baseline began for all three communicative functions at the same time. Intervention procedures were implemented with one function for each child. When the child began to show progress, a baseline probe was conducted for the remaining functions and intervention was extended to one of these. Finally, when the child showed progress on the second function, intervention was implemented with the third and remaining function following a final baseline probe.

Baseline. The baseline phase for each participant consisted of recording communicative opportunities occurring across the normal daily routine of the child in the classroom. The teacher was asked to follow her normal routine. A baseline session began when the teacher began one of the identified activities and data were collected for 10 min during each of these sessions. Using the definitions for opportunities, prelinguistic, and replacement behaviors for each function as described in Table 2, each occurrence of an opportunity was recorded together with occurrences of prelinguistic or replacement behaviors that followed within 10 s of the opportunity.

Intervention. Intervention began with a 30 min inservice training program during which the teacher received instructions on how to encourage, acknowledge, and respond to the child’s replacement behavior. A one-page summary sheet was provided to the teacher for each communicative function. The sheet outlined what constituted an opportunity and how to acknowledge, prompt, and react to the
Replacing Prelinguistic Behaviors

replacement behavior (See the Appendix for a sample sheet). Following the inservice, the teacher was asked to follow the instructions set out in the summary sheet during the targeted activities and was given regular feedback on the child’s progress. This feedback occurred after every 3rd or 4th intervention session and consisted of showing the teacher the results obtained from the previous sessions. Specifically, the teacher was shown a graph of the number of opportunities presented to the child during each session together with changes to the child’s prelinguistic and replacement behaviors. Results were discussed with the teacher, as were ways that the teacher might increase the number of opportunities. During this time, the teacher’s use of the intervention procedures was also discussed and the teacher was encouraged to use the procedures and respond consistently to the child’s behavior by following the steps and directions of each summary sheet.
Intervention sessions were arranged as for baseline. That is, an intervention session began when the teacher initiated one of the identified activities in the course of the child’s normal classroom routine. Data were recorded for 10 min during each session. Each opportunity that the child received was recorded as was the presence or absence of the prelinguistic and replacement behaviors within 10 s of the opportunity. Definitions for opportunities, prelinguistic, and replacement behaviors during intervention were the same as those of baseline and contained in the one page summary sheets provided to the teacher for each function. The teacher inservice for the second and third functions consisted of a review of the instructions on how to encourage, acknowledge, and respond to the child’s replacement behavior and provision of a summary sheet for that particular function.

**Interobserver agreement.** Videotapes were made of randomly selected baseline and intervention sessions to enable assessment of interobserver agreement. An independent observer scored each videotape for the occurrence of opportunities, and the presence or absence of prelinguistic and replacement behaviors. These data were compared to those obtained by the primary observer. The percentage of sessions with agreement data per child ranged from 0% to 33% with a mean of 16%. The percentage of sessions with agreement data in baseline ranged from 0% to 33% with a mean of 19%. The percentage of sessions with agreement data for intervention ranged from 6% to 33% with a mean of 13%. The 0% reflects an oversight to collect videotape during baseline for just one child (Dave) and for just one of his functions (choice making).

An agreement was counted if the two observers recorded the same opportunity, prelinguistic, or replacement behaviors at the same time (to the nearest 15 s). Any discrepancy was recorded as a disagreement. A percentage of agreement
was calculated at the end of each session using the formula: Agreements/(Agreements + Disagreements) x 100%. Percentages of agreement for baseline sessions ranged from 75% to 100% with a mean of 94%. For intervention sessions, 100% agreement was achieved for all children across all communicative functions with the exception of Ian’s choice making function, where the percentage agreement was 91%.

Results

Dave

Figure 1 shows the results for Dave. Intervention was associated with an increase in the replacement behavior. Specifically, waving increased from a mean of 7% during baseline to a mean of 50% during intervention. However, there was little change in the prelinguistic behavior of looking at the person to be greeted (in the absence of waving) after the teacher inservice, with a mean of 27% during baseline and 33% during intervention. For Function 2 (requesting), there was an increase in the replacement behavior from 16% during baseline to 65% during intervention and a corresponding decrease in the prelinguistic behavior from 69% during baseline to 22% during intervention. With the onset of intervention in the choice making function, the prelinguistic behavior decreased (from a mean of 79% during baseline to 0% following intervention) and the replacement behavior increased from 0% during baseline to 100% after intervention.
Ian

The results for Ian are shown in Figure 2. Intervention started with the function of requesting a turn after four baseline sessions. Ian’s prelinguistic behavior of reaching for an activity decreased from a mean of 73% during baseline to 18% following the teacher inservice, whereas the replacement behavior of pointing to a photo of the activity increased from 0 to 51%. Similar results were achieved for requesting food, with the replacement behavior increasing from 0 at baseline to 35% during intervention and prelinguistic behavior decreasing from 53% at baseline to 11% during intervention. The third function (choice making) showed a decrease in the prelinguistic behavior of reaching from 100% to 19% following intervention and a corresponding increase in the replacement behavior of pointing to the photo from 0% to 55%.

_____________________________________________________

Insert Figure 2 about here

_____________________________________________________

Patrick

Patrick’s results are shown in Figure 3. Intervention for requesting a turn was associated with an increase in the replacement behavior from 31% during baseline to 71% during intervention. At the same time, the mean percentage of opportunities with the prelinguistic behavior showed little change from baseline (26%) to intervention (25%). However, across the last four intervention sessions, the prelinguistic behavior showed a decrease and the replacement behavior increased. For the second function of requesting food, the replacement behavior increased from 11% at baseline to 47% during intervention and the prelinguistic behavior decreased from 52% at baseline to
Replacing Prelinguistic Behaviors

19% during intervention. Similar results were obtained for choice making with a decrease in prelinguistic behavior from 90% to 31% and an increase in the replacement behavior from 0% to 64%.

______

Insert Figure 3 about here

______

Beth

Results for Beth are shown in Figure 4. Intervention began with requesting food. During baseline, the prelinguistic response occurred during 97% of the opportunities and at no time did Beth use the replacement behavior. With intervention, the replacement behavior increased to 51% and the prelinguistic behavior decreased to a mean of 24%. The second intervention was choice making, where the replacement behavior increased from 0 to 94% while the prelinguistic behavior decreased from 20% to 3%. With the third function, requesting a turn, the replacement behavior of signing ‘me’ did not occur prior to or following intervention and the prelinguistic behavior persisted with a mean of 96% during baseline and 100% following the teacher inservice.

______

Insert Figure 4 about here

______

Teacher Response

Table 3 shows the number of opportunities per min provided by the teachers for each communicative function during baseline and intervention. An increase in teacher provided opportunities occurred for 66% of the functions once intervention
began. However, there was a decrease in the number of opportunities provided to Ian, Patrick, and Beth to request food following intervention and no change in the number of opportunities that Patrick was given to request a turn.

Data for the teacher’s use of opportunities, acknowledgements, and responses (OAR) for each child during intervention appear in Figure 5. The average OAR rates for Patrick’s teacher were 70% for requesting a turn, 76% for requesting an object and 74% for choice making. Teacher OAR rates for Beth were 89% for requesting an object, 94% for choice making and 44% for requesting a turn. The mean OAR rates for Ian’s teacher were 70% for requesting a turn, 89% for choice making, and 65% for requesting an object, however this OAR rate was 93% when averaged over the last six intervention sessions. For Dave’s teacher, the OAR rate for requesting food was 75% and choice making was 80%. The average OAR rate across all sessions for greeting was 48%, although the teacher achieved a rate of 100% over the last two sessions.

Discussion

The results from this study suggest that an intervention package consisting of inservice training, consultation, and feedback can be effective in replacing prelinguistic behaviors with more symbolic and conventional forms of communication. Overall, the four participants showed an increase in replacement
behavior and a corresponding decrease in prelinguistic behavior across a range of communicative functions during intervention. One exception was the function of requesting a turn with Beth in which the prelinguistic behavior persisted and the replacement behavior failed to develop.

Some reasons are offered to explain this disappointing result for Beth. First, while the number of opportunities for Beth to request a turn increased with intervention, the teacher’s average OAR rate during intervention for this function was 44%, which is relatively low when compared to the OAR rate of 89% for requesting food and 94% for choice making. Perhaps there was not sufficient use of OAR by the teacher for Beth to acquire the replacement skill for requesting a turn. Second, a graphic mode was chosen for the first two functions, but a gestural or vocal mode (i.e., signing or saying ‘me’) was targeted for requesting a turn. The lack of acquisition for requesting a turn may indicate that gesture or vocal mode communication was less appropriate for Beth. Third, the prelinguistic behavior (running to teacher) may have been easier for Beth to perform than the replacement behavior (sign or say ‘me’). In addition, this prelinguistic behavior may have been resistant to extinction due to a history of intermittent reinforcement. It would appear that the replacement behavior might need to be more efficient than the prelinguistic behavior if the former is to replace the latter. That is, the replacement behavior may need to be easier in terms of response effort and produce more consistent and immediate reinforcement (Horner & Day, 1991).

In some cases, prelinguistic behaviors may persist if they are reinforced intermittently or co-occur with a replacement behavior that is reinforced (Drasgow, Halle, & Ostrosky, 1998). For example, whereas Dave showed an increase in the
replacement greeting behavior (waving) during intervention, the prelinguistic behavior (looking) did not show a collateral decrease. This may reflect the fact that the two response topographies could and often did occur at the same time. Thus on many occasions during intervention when the replacement behavior was reinforced, so too was the accompanying prelinguistic behavior. In any case, from an applied perspective, the intervention was effective in teaching Dave a more sophisticated way to greet others. This example also exposes the need to consider that in some instances, there may be no need to replace the prelinguistic behavior, but rather the goal of intervention might be to pair it with a more conventional communication signal.

An interesting finding of this study was the acquisition of replacement behavior for the function of requesting food with Patrick, Ian, and Beth, when the number of opportunities actually decreased following the teacher inservice. However, while the number of opportunities decreased during intervention, the average OAR increased, especially over the final few intervention sessions. Perhaps acquisition is facilitated not simply as a result of increased opportunities, but when the teaching opportunities include appropriate acknowledgement and reaction.

Overall, the procedures used in this study have similarities to those used in FCT for the treatment of challenging behavior. Initially, the underlying communicative function for the prelinguistic behavior was assessed through structured interviews and observation. In a sense, a functional assessment was conducted to identify the communicative function of a child’s prelinguistic behaviors. Interventions were then linked to the results of this assessment. That is, the children were taught replacement behaviors that served the same function as their prelinguistic behaviors. By focusing on the replacement of prelinguistic behaviors, the children in
this study appeared to learn to express a range of communicative functions using more symbolic and conventional forms of communication.

While the prelinguistic forms identified in this study were not problematic, they were fairly subtle and idiosyncratic and thus open to possible misinterpretation. It is possible that when a child’s communicative attempts are subject to frequent misinterpretation, then there may be escalation to more problematic response topographies in an effort to repair the communicative breakdown. For example, if the child’s attempt to request a preferred item by vocalizing is misinterpreted, then the child may escalate to crying. Further research should examine the possible link between misinterpreted prelinguistic actions and the emergence of challenging behavior in children with developmental disabilities and severe communication impairment.

One limitation of this study is the relatively small percentage of interobserver agreement data that were collected with some children. However, we are confident that these data are reliable given the high percentages of agreement that were obtained. Another limitation is the absence of generalization and follow-up data. While procedures employed in this study have been associated with improved generalization outcomes across settings and situations (Drasgow et al., 1998), the study could have been improved by collecting generalization and follow-up data. However, in the main, the intervention effect was replicated across three functions and activities. Unfortunately, it was not possible to collect follow-up data due to the close of the school year.

An area of needed research is the impact of the rate and quality of teacher behavior on the acquisition of replacement behaviors. The results for Beth suggest
that an OAR rate of 44% is insufficient to promote acquisition. However an average OAR rate of 65% was sufficient for Ian to learn a replacement behavior for requesting food even when fewer opportunities were provided during intervention as compared to baseline. Acquisition of replacement forms may depend to some extent on the rate, timing, and quality of teacher provided opportunities, acknowledgements, and reactions. Future efforts should also focus on extending the use of this type of replacement-based intervention to other communicative functions and partners, such as parents. Through such efforts, children with developmental disabilities and severe communication impairment may advance beyond the prelinguistic stage, enabling these children to communicate more efficiently and effectively.
References


Appendix

Intervention Sheet Provided To The Teacher For Teaching Ian To Request A Turn

Opportunity:
An opportunity occurs when, during group time, you present a photo of an activity or toy, look at Ian and ask ‘Do you want a turn?’ with an expectant facial expression, which is maintained for 10 seconds unless he responds correctly within that time.

Acknowledge/Prompt:
Occurs when you either praise Ian’s replacement behavior, or prompt that behavior if it does not occur or is incorrect. Acknowledgement must occur immediately after Ian touches the photo and consists of verbal praise of both the replacement behavior (“good pointing, Ian”) and the presumed function (“you asked for a turn”). Prompting will be recorded only after you have waited 10 seconds for a correct response from Ian and must include a consistent verbal instruction, physical guidance, and/or a model of both the replacement behavior and the function (“Ian, point to the photo if you want a turn”).

React:
Occurs when you react within 3 seconds to Ian’s replacement behavior in a manner that is consistent with the presumed function of the behavior and in a way that would be likely to reinforce the behavior (e.g., when Ian requests a turn, he would immediately be given a turn).

OAR:
Occurs when you have successfully provided a complete cycle of opportunity, acknowledgement, and reaction, as described above.
Table 1

Description of Participants

<table>
<thead>
<tr>
<th>Child</th>
<th>Age (years:months)</th>
<th>TARC (standard score)</th>
<th>REEL-2</th>
<th>DBC (percentile rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dave</td>
<td>7:7</td>
<td>43</td>
<td>RLA 6</td>
<td>97% ELA 6</td>
</tr>
<tr>
<td>Ian</td>
<td>4:5</td>
<td>32</td>
<td>RLA 5</td>
<td>73% ELA 6</td>
</tr>
<tr>
<td>Patrick</td>
<td>4:5</td>
<td>28</td>
<td>RLA 6</td>
<td>91% ELA 4</td>
</tr>
<tr>
<td>Beth</td>
<td>3:7</td>
<td>17</td>
<td>RLA 9</td>
<td>93% ELA 5</td>
</tr>
</tbody>
</table>
Table 2

Description of Functions, Activities, Opportunities, Prelinguistic, and Replacement Behaviors

<table>
<thead>
<tr>
<th>Child</th>
<th>Function</th>
<th>Activity</th>
<th>Opportunity</th>
<th>Prelinguistic behavior</th>
<th>Replacement behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dave</td>
<td>Greet</td>
<td>Group time</td>
<td>Look at him, say ‘Hello Dave’</td>
<td>Look at person</td>
<td>Wave</td>
</tr>
<tr>
<td></td>
<td>Requesting</td>
<td>Morning snack</td>
<td>Place 2 photos on table (1 food, 1 ‘No’ card)</td>
<td>Randomly points at both photos</td>
<td>Point to photo of food and choose matching food items from plate</td>
</tr>
<tr>
<td></td>
<td>Choice making</td>
<td>Toy play</td>
<td>Show toys and photos of toys and say ‘Which toy, Dave?’</td>
<td>Reach for a toy</td>
<td>Point to photo of toy and takes matching toy</td>
</tr>
<tr>
<td>Ian</td>
<td>Turn taking</td>
<td>Group time</td>
<td>Show photo of toy or ask ‘Do you want a turn?’</td>
<td>Reach for toy/activity.</td>
<td>Point to photo of toy/activity</td>
</tr>
<tr>
<td></td>
<td>Choice making</td>
<td>Toy play</td>
<td>Show 2 photos of toys, say ‘Which toy, Ian?’</td>
<td>Reach for toy, look at preferred toy.</td>
<td>Point to photo and choose matching toy</td>
</tr>
<tr>
<td></td>
<td>Requesting</td>
<td>Afternoon snack</td>
<td>Place photo of food and food on table, hand out.</td>
<td>Reach for food item</td>
<td>Tap teacher’s hand, point to photo of food, and choose matching food item from plate</td>
</tr>
</tbody>
</table>
### Table 2 (continued)

<table>
<thead>
<tr>
<th>Child</th>
<th>Function</th>
<th>Activity</th>
<th>Opportunity</th>
<th>Prelinguistic behavior</th>
<th>Replacement behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick</td>
<td>Turn taking</td>
<td>Group time</td>
<td>Show a toy or activity to group or ask ‘Who wants a turn?’</td>
<td>Reach for toy/activity.</td>
<td>Tap teachers on hand and sign ‘me’</td>
</tr>
<tr>
<td></td>
<td>Choice making</td>
<td>Toy play</td>
<td>Place 2 photos on table with matching toys out of reach, ask ‘Which toy, Patrick?’</td>
<td>Reach for preferred toy.</td>
<td>Point to photo and take matching toy</td>
</tr>
<tr>
<td></td>
<td>Requesting</td>
<td>Afternoon snack</td>
<td>Place food on table out of reach.</td>
<td>Reach for food.</td>
<td>Tap teacher’s hand and sign ‘eat’</td>
</tr>
<tr>
<td>Beth</td>
<td>Turn taking</td>
<td>Group time</td>
<td>Show activity and ask ‘Who wants a turn?’</td>
<td>No response or runs to teacher.</td>
<td>Sign or say ‘me’</td>
</tr>
<tr>
<td></td>
<td>Requesting</td>
<td>Morning snack</td>
<td>Place photo on table with matching food out of reach, hand extended.</td>
<td>Reach for food.</td>
<td>Point to photo and take matching food item</td>
</tr>
<tr>
<td></td>
<td>Choice making</td>
<td>Toy play</td>
<td>Show 2 photos with matching toys out of reach, ask ‘Which one, Beth?’</td>
<td>Reach for preferred toy.</td>
<td>Point/touch photo, take matching toy</td>
</tr>
<tr>
<td></td>
<td>(toys)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3

Mean Number of Opportunities per Minute for each Child Across Functions for Baseline and Intervention

<table>
<thead>
<tr>
<th>Child</th>
<th>Function 1 Baseline</th>
<th>Function 1 Intervention</th>
<th>Function 2 Baseline</th>
<th>Function 2 Intervention</th>
<th>Function 3 Baseline</th>
<th>Function 3 Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dave</td>
<td>0.8</td>
<td>1.0</td>
<td>0.52</td>
<td>0.7</td>
<td>0.38</td>
<td>0.57</td>
</tr>
<tr>
<td>Ian</td>
<td>0.25</td>
<td>0.35</td>
<td>0.62</td>
<td>0.42</td>
<td>0.52</td>
<td>0.6</td>
</tr>
<tr>
<td>Patrick</td>
<td>0.4</td>
<td>0.41</td>
<td>1.06</td>
<td>0.71</td>
<td>0.44</td>
<td>0.7</td>
</tr>
<tr>
<td>Beth</td>
<td>1.23</td>
<td>0.67</td>
<td>0.02</td>
<td>0.66</td>
<td>0.52</td>
<td>0.82</td>
</tr>
</tbody>
</table>
Figure Captions

Figure 1. Dave’s prelinguistic and replacement behaviors as a percentage of opportunities during baseline and intervention for greeting, requesting object and choice making.

Figure 2. Ian’s prelinguistic and replacement behaviors as a percentage of opportunities during baseline and intervention for requesting a turn, requesting object and choice making.

Figure 3. Patrick’s prelinguistic and replacement behaviors as a percentage of opportunities during baseline and intervention for requesting a turn, requesting object and choice making.

Figure 4. Beth’s prelinguistic and replacement behaviors as a percentage of opportunities during baseline and intervention for requesting object, choice making and requesting a turn.

Figure 5. Opportunities, acknowledgements and reactions (OAR’s) as a percentage of the total number of opportunities for each child across three functions during intervention.