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Coaching Parents of Young Children with Complex Communication Needs to Implement Aided Language Stimulation Using Pragmatic Organisation Dynamic Display Communication Books

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ABSTRACT

The aim of this pilot study was to explore the feasibility and language outcomes of coaching parents to implement an aided language stimulation intervention using Pragmatic Organisation Dynamic Display (PODD) communication books. Two parent–child dyads, with children aged 4 years 6 months and 4 years 8 months participated in a home-based intervention. An AB design was used. Data were collected in mealtime and play activities. Dependent variables were frequency of parent use of AAC symbols and speech and frequency of child symbol use (speech, signs or graphic symbols). The intervention was feasible as parents reported they were confident in implementing it and the timeframes were appropriate for single-case research designs. An increase in parent AAC symbol use was associated with PODD book use in mealtime and for one parent in play. Both children increased their symbol use, with the clearest association in the mealtime activity. Overall, the encouraging results suggest that this approach warrants further research using stronger designs.

KEYWORDS

augmentative and alternative communication (AAC); aided language stimulation; Pragmatic Organisation Dynamic Display (PODD); children; coaching parents; early intervention

Introduction

Augmentative and alternative communication (AAC) refers to a variety of communication modes and strategies that support or replace speech and may also assist comprehension, for people who have little or no intelligible speech (Beukelman & Mirenda, 2013). Young children with little or no speech are likely to benefit from AAC in their everyday environments to support their speech and language development. Yet, relatively few early intervention experimental studies have been carried out involving parents and their young children (Behnami & Clendon, 2015; Romski, Sevcik, Barton-Hulsey, & Whitmore, 2015). Light and McNaughton (2015) called for more research investigating real-world outcomes in natural settings.

AAC language systems are unaided (e.g. signs) or aided (e.g. graphic symbols) forms of AAC (Beukelman & Mirenda, 2013) that provide access to sufficient vocabulary for communication to meet the individual's needs for language comprehension and expression in all daily environments (Porter & Cafiero, 2009). To create a rich language learning

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environment at home, parents will need to use the AAC modes themselves for genuine purposes as a first step to their children learning to use an AAC language system (Von Tetzchner, Stadskleiv, Smith, & Murray, 2016). One such approach is *aided language stimulation*.

Goossens' (1989, p. 16) first described aided language stimulation as where '... the facilitator (clinician, parent) points out picture symbols on the child's communication display in conjunction with all ongoing language stimulation'. Aided language stimulation requires a communication aid to be available with relevant vocabulary for receptive language input and to enable self-initiated expressive language output (Cafiero, 1995; Goossens', Crain, & Elder, 1992; Porter, 2007, 2018). It is a multimodal approach, using speech, key word signs (optional) and graphic symbols in everyday activities (Goossens', Crain, & Elder, 1992; Porter, 2007, 2018). Aided language stimulation incorporates language stimulation strategies, such as *waiting* and *sabotage* to encourage initiation of communication; *modelling*, *repetition* and *expansion* (Goossens', Crain, & Elder, 1992; Pepper & Weitzman, 2004; Porter, 2007, 2018); and providing *natural feedback*, where adults *verbally reference* what they or the child are doing (Porter, 2007, 2018).

Research supports an aided language approach as an effective, evidence-based AAC strategy to enhance comprehension and to develop pragmatic, semantic and syntactic language skills (Allen, Schlosser, Brock, & Shane, 2017; O'Neill, Light, & Pope, 2018; Sennott, Light, & McNaughton, 2016). There is evidence that this approach can be implemented successfully by parents at home (Cafiero, 1995; Romski et al., 2010).

The Pragmatic Organisation Dynamic Display (PODD) communication system (Porter, 2007) is designed as a comprehensive AAC language system and a tool for implementing aided language stimulation. The PODD system includes *low tech*, paper-based communication books and *high tech*, electronic page sets for communication devices, allowing individuals to develop an integrated communication system to suit their varied needs. PODD books are organised to be developmentally and functionally appropriate for young children, including children with severe intellectual disabilities. Design features include (a) vocabulary organised to scaffold learning of pragmatic, semantic, syntactic and morphological language functions; (b) frequently used *core* words repeated across contexts; and (c) a large pool of extended *fringe* words, which enable people to talk specifically (Porter, 2018). The robust vocabulary enables communication partners to model both predictable and unpredictable messages. This helps to develop children's comprehension, build shared meanings and develop expressive use over time.

The PODD communication system has been described as a promising practice (Beukelman & Mirenda, 2013; Porter & Cafiero, 2009) but is only beginning to be formally researched (Snodgrass & Meadan, 2018). Snodgrass and Meadan reported on an instructional training program using an electronic PODD page set for a young child. The team members learned the instructional strategies, but results indicated no clear child outcomes. The authors suggested that this may have been because the demands of the electronic page set were not well matched to the child's abilities and support needs.

Parent training and coaching are recommended methods of service delivery in early communication and language interventions (Brown & Woods, 2016). This involves a triadic model, whereby an interventionist teaches parents to use strategies designed to promote their child's communication, parents use these strategies during interactions with their child and, if successful, the child responds within these interactions learning new skills (Brown &

Woods, 2016). Successful coaching includes provision of verbal and written information, demonstration by a skilled practitioner, practicing skills with constructive feedback and opportunities for joint problem-solving and reflection (Brown & Woods, 2016). In the current study, the term 'parent training' refers to initial teaching of skills within a workshop setting and the term 'parent coaching' refers to collaboratively working with parents to implement the communication intervention within the real-life context at home.

In recent reviews (Kent-Walsh, Murza, Malani, & Binger, 2015; Shire & Jones, 2015) supporting the efficacy of communication partner implemented interventions, only a relatively small number of studies have focussed on parent-implemented aided language stimulation interventions for young children (0–6 years). No experimental studies have yet been reported using paper-based PODD communication books. Given that PODD communication books are being used in clinical practice, further research into this approach is needed. This pilot study was designed to explore the feasibility of coaching parents of young children to implement an aided language stimulation intervention using PODD books at home and to measure the parent and child language outcomes of this early intervention. The research questions were (a) What is the feasibility of, and the timeframes required, for coaching parents to implement an aided language stimulation intervention using PODD communication books at home? (b) What changes in parents' AAC symbol use and speech are associated with this intervention? (c) What changes in children's symbol use are associated with this intervention? and (d) What is the social validity of this intervention?

Method

Research Design

An AB single-case design was selected. Although an AB design does not allow strong conclusions regarding causation to be drawn (Barlow & Hersen, 1984; Vannest, Davis, & Parker, 2013), given the exploratory nature of this pilot study, it was considered to be the most suitable design. It allowed for trial of measurement methods and flexibility with intervention timeframes, which were uncertain. Problems associated with the stronger multiple baseline design relate to the ethical and practical issues of holding participants on baseline for extended periods before commencing the intervention (Kazdin, 1982; Ledford & Gast, 2018). Given the unknown of timeframes in this pilot study, the AB design avoided these potential issues.

Ethical Approval

Approval for the study was obtained from the university human ethics committee. Each parent provided informed written consent, following provision of written information approved by the Ethics Committee.

Participants

The selection criteria were as follows: (a) each dyad consisted of one parent or carer who was the primary caregiver and their child; (b) parents spoke English as their first language

at home; (c) children were aged between 1 and 5 years and had not yet started school, with little or no speech, operationally defined as 15 words or fewer (Dada & Alant, 2009) and had an associated developmental disability; and (d) children could point directly to a display.

Participants were recruited through a large not-for-profit early intervention provider and from speech-language pathologists who were informed of the prospective study. Four dyads were referred, and two dyads met criteria for participation. Both parents had completed the Hanen program (Pepper & Weitzman, 2004) when their children were around 3-years-old. Both parents were using key word signs with their children before the study began and continued other interventions during the study. Both children were formally assessed using the Vineland Adaptive Behaviour Scales, Second Edition (VABS-II) (Sparrow, Cicchetti, & Balla, 2005), the MacArthur-Bates Communicative Development Inventories – Words and Gestures (MB-CDI) (Fenson et al., 2007) and the Pragmatic Profile of Everyday Communication Skills in Pre-School Children (Dewart & Summers, 1995) before baseline measures commenced, to provide information about their overall development and their receptive and expressive language skills. Results are summarised in Table 1.

Dyad 1

Parent 1, the father and primary caregiver of Child 1, was aged 43 years, university educated, and worked full time in a professional role. Child 1 was a boy with Down

Table 1. Assessment information.

Scale and Summary Information	Child 1	Child 2
Vineland Adaptive Behavior Scales, second edition (Sparrow, Cicchetti, & Balla, 2005)		
Receptive language age equivalent	1;9	4;7
Expressive language age equivalent	1;1	1;5
Written language age equivalent	2;9	3;1
Communication standard score	59	76
Daily living skills standard score	58	73
Socialisation standard score	70	77
Motor skills standard score	61	64
Adaptive behaviour overall standard score	59	69
MacArthur-Bates Communicative Development Inventories – Words and Gestures (Fenson et al., 2007)		
Number of words understood	100	274
Number of speech approximations	1	7
Number of sign approximations	25 (imprecise, hard to recognise)	56
Pragmatic Profile of Everyday Communication Skills in Pre-School Children (Dewart & Summers, 1995)	Mainly used non-symbolic communication, facial expression, body language. Gestures and signs for some early pragmatic functions; unable to use language to make comments or relate information	Used range of early pragmatic functions; expressed messages using facial expression, body language, gestures, speech approximations, key signs; at one-word level, with occasional two-word sign combinations

syndrome, and at the beginning of the study was aged 4 years 6 months. On the VABS-II (Sparrow, Cicchetti, & Balla, 2005) Child 1 achieved a standard score of 59, with significant delays across all domains. Child 1's receptive language age level was 1 year, 9 months and his expressive language was at an age equivalent of 1 year, 1 month. Results on the MacArthur-Bates Communicative Development Inventories – Words and Gestures (MB-CDI) (Fenson et al., 2007) indicated Child 1 understood 100 everyday words; he produced one speech approximation and 25 sign approximations that were imprecise and hard to recognise. Observations from the Pragmatic Profile (Dewart & Summers, 1995) indicated that Child 1's expressive communication was mostly non-symbolic behaviours such as facial expression, body language, and eye contact. He occasionally used gestures/sign approximations for early pragmatic functions such as requesting, greeting, protest and recurrence, with prompting. He was not able to relate information or to comment at all.

Child 1's parents reported that he had a moderate conductive hearing loss, with intermittent use of a conductive hearing aid. He demonstrated adequate visual skills to recognise small picture symbols (e.g. 2 cm × 2 cm) on visual grid displays. He was mobile, with delayed gross and fine motor skills. He pointed to pictures using both hands and had very limited vocalisations. He attended preschool 3 days-per-week, day care 2 days-per-week, a 2-hr weekly applied behaviour analysis (ABA) program in the community and an ABA support worker visited him 3-hr twice weekly at home. ABA therapists introduced the Picture Exchange Communication System (PECS; Bondy & Frost, 1994) before the study but PECS was not used by his parents. Before the study, Child 1 used a song choice board with 10 pictures with his parents at home.

Dyad 2

Parent 2, the mother and primary caregiver of Child 2, was aged 47 years, worked part-time in a professional role, and was studying for a postgraduate degree. Child 2 was a girl with a rare genetic disorder, involving a deletion of approximately 30 genes on chromosome 17, and at the start of the study was aged 4 years 8 months. On the VABS-II Child 2 achieved a standard score of 69 with significant delays across most domains and particularly low scores for expressive language (age equivalent to 1 year, 5 months). In contrast, her highest score was for receptive language (age equivalent to 4 years, 7 months), indicating Child 2's receptive language skills were near to her chronological age. On the MB-CDI-Words & Gestures Child 1 understood 274 everyday words, produced seven speech approximations and 56 signs. On the Pragmatic Profile, Child 2's expressive communication included a range of early pragmatic functions using facial expression, body language, gestures, speech approximations and key signs mainly at a one-word level.

Results of hearing and vision assessments were reported by her parent to be within normal limits. Her visual acuity was adequate to identify small pictures (e.g. 2 cm × 2 cm) on visual grid displays. She was mobile with delayed gross and fine motor skills and pointed to pictures using her right hand. She attended a Montessori preschool 3 days-per-week. Her speech approximations included words for counting and jargon-like sounds. About 10 single-level aided language displays (Porter & Cameron, 2007) had been provided for her at home but were not being used before the study.

Setting and Materials

The study was conducted at the family homes, except for training sessions for the parents of Child 1 that were conducted in a university training room. Baseline and intervention sessions occurred during a mealtime and play activity for each child. Coaching and parent–child interactions used for data collection were carried out in the relevant areas of the family home (e.g. dining room, play room).

Throughout the intervention, all aided language resources used coloured Picture Communication Symbols produced with Boardmaker software (Mayer-Johnson, 1981–2006). For the parent training sessions, materials included (a) single-level, laminated, A4-sized aided language displays with 12 or 20 pictures per page (Porter & Cameron, 2007), including general interaction and mealtime displays; and (b) a full set of multi-level, direct-access PODD templates (Porter, 2007), including one and two-page PODD books, for demonstration purposes. The PODD resources included (a) *early functions* one-page PODD books, designed with early pragmatic functions for *here and now* communication; and (b) the other *expanded functions* one and two-page PODD books, which allow expression of more abstract concepts including time (e.g. past and future events). Written materials included a copy of the PowerPoint slides presented in the training, operational definitions of language stimulation strategies and the handout 'Using Aided Language Stimulation at Home' (Porter & Cameron, 2007).

During parent coaching, in addition to the aided language resources specified below, parents and the researcher developed a parent-friendly description of the goals and strategies for each parent – child dyad; and weekly information sheets were provided (Theodorsen, 2016). A Sony video camera and tripod were loaned to each parent for the duration of the study to allow them to video-record mealtime and play activities.

Dyad 1

For mealtime, materials included food, drink and children's books typically used by the family. Toys for play included blocks, ball, doll, toy cars and trains. Dyad 1 used 12-per-page aided language displays (Porter & Cameron, 2007) and PODD communication books (Porter, 2007) including (a) a slightly customised paper one-page early functions PODD 12 book (12 pictures per page), (b) a partial version of a laminated one-page expanded functions PODD 20 book (20 pictures per page), and (c) a laminated template one-page expanded functions PODD 16 book. Symbols were about 4 cm × 4 cm, in a 4 × 3, 4 × 4 and a 5 × 4 grid, in landscape format. Child 1's customised PODD 16 bookwas made smaller for portability (80% of an A4 page size).

Dyad 2

For mealtime, food, drinks and occasionally children's books were used. Toys for play included props for counting songs (e.g. pretend sausages), fun animal figures and play dough. Dyad 2 used 20-per-page aided language displays (Porter & Cameron, 2007) and two PODD communication books (Porter, 2007): (a) a laminated template PODD 36 book (a two-page book with a side-flap); (b) a laminated template one-page expanded functions PODD 20 book. Symbols varied in size from 3 cm × 3 cm on a 6 × 6 grid to 4 cm x 4 cm on a 5 × 4 grid. Child 2's customised PODD 20 book was made smaller for portability (80% of an A4 page size).

Dependent Variables

The parent-dependent variables were (a) frequency of parent AAC symbol use, and (b) frequency of parent speech. Parent AAC symbol use was coded as an event each time the parent used an individual sign, conventional gesture or an aided AAC symbol. Signs were Auslan signs or gestures (Scope Australia, 2015). Each sign was coded as a separate event. Parent use of aided AAC was operationally defined as pointing to or touching a picture/item on a communication display. Each point or touch was counted as a separate event. Frequency of parent speech was measured by counting the number of words spoken by each parent within the 5 min data collection period for each session.

The child-dependent variable was the frequency of the child's symbol use. This was operationally defined as spoken words, intelligible speech approximations, key word signs/gestures, recognisable sign approximations and pointing to symbols on an aided language display or a PODD book. Speech approximations concurrent with use of another modality were counted as one event. Speech approximations used on their own or consecutively, before or after another modality, were counted as separate events. Conventional gestures for 'yes' (nodding head) and 'no' (shaking head) were included.

Independent Variables

The independent variables were the parent training and parent coaching in the aided language stimulation intervention, which enabled parents to implement the intervention, using aided language displays, a PODD communication book and language stimulation strategies during interactions with their children.

Procedures

All training and coaching was carried out by the first author who is a speech pathologist experienced in unaided and aided AAC and a certified PODD presenter. Before baseline, the first author met with parents at their home to gather assessment information and to assist with initial set up and use of the video camera. Parents video-recorded baseline measures of their interactions with their children prior to parent training.

Parent Training

A questionnaire was given to parents before their first training session, to obtain information about their attitudes, knowledge and experience of AAC and any concerns. Two 3-hr training sessions were delivered to parents, without the child present, using a PowerPoint presentation and interactive strategies. Parent training content included (a) definitions of communication, language and AAC; (b) rationale for aided language stimulation; (c) introduction to aided language displays and PODD communication books; (d) language stimulation strategies, including wait, sabotage, self-talk, parallel-talk, repetition, imitation and expansion; (e) aided language modelling; (f) an outline of the research phases; and (g) discussion of parent/child goals. Aided language stimulation instructional strategies were consistent with those used in introductory PODD workshops (Porter, 2018). The first author used videos and face-to-face models to demonstrate use of resources and strategies. Parents practiced aided language stimulation using general interaction and mealtime

aided language displays, followed by structured practice with a one-page expanded functions PODD 12 book. At the end of the training, in collaboration with the first author, all parents selected aided language displays to introduce at home immediately and selected the type of PODD book to initially trial with their child once parent coaching started. Parents then completed an evaluation to provide feedback about the training.

Parent Coaching

Parent coaching commenced on a weekly basis about 1 week after parent training. Coaching strategies included providing information and explanation, demonstration, guided practice (with the first author providing suggestions and/or feedback whilst she and the parent implemented the intervention with the child together, either simultaneously or taking turns to be the primary partner) and caregiver practice (with the first author providing suggestions and/or feedback whilst observing the parent implement the intervention as the primary partner with the child), joint problem solving and reflection (Brown & Woods, 2016). Most coaching sessions (1–2 hrs) were conducted face-to-face in the families' homes, and several were conducted using Skype. Dyad 1 had 13 coaching sessions over 18 weeks. Dyad 2 had 12 coaching sessions over 16 weeks. There were interruptions due to factors such as illness and moving home. Videos were reviewed to assist planning.

During initial face-to-face coaching sessions, the clinician and parents both interacted with the child. Parents were encouraged to (a) provide an aided language model using speech, pointing to pictures and using key signs and gestures; (b) speak using simple language, suitable for their child's level of receptive language; and (c) use language stimulation strategies. In the early sessions, parents learned to model early pragmatic functions/sections, such as general interaction ('quick chat'), commenting ('I like something' and 'I don't like something'), complaining ('something's wrong') and requesting an activity ('I want something'). Coaching also included assistance in learning operational skills required when using a PODD book, such as (a) pointing to navigational messages (e.g. 'turn the page') and navigating from one section of the book to another, and (b) initiating communication (e.g. raising your hand and pointing to the message on page 1 'I've got something to say'). During the second half of the intervention, pragmatic functions progressed to include request actions ('do something'), questions ('I'm asking a question') and relating information ('I'm telling you something'). Parents were encouraged to implement aided language stimulation throughout the day, using the aided language displays and the PODD books and applying the strategies they were coached in each week.

From the first (Dyad 2) and second (Dyad 1) coaching session onwards, PODD books were provided to families and trialled until the type to be customised was selected and made. For his son, Parent 1 selected an expanded functions PODD 16; for her daughter, Parent 2 selected an expanded functions PODD 20. The researcher and parents worked collaboratively to customise vocabulary and make their child's PODD book. These were completed just before the last week of intervention.

Measurement

Mealtime and play sessions were video-recorded for 15–30 min per activity with only the primary parent caregiver and their child present. Video-recording commenced at the

beginning of the activity and each activity was coded for 5 min starting after the first minute of each video-recording.

Mealtime and play activities were carried out at similar times each day. Mealtime was a predictable routine activity, while the play activities varied. Parents were asked to play with their children as they usually did at home.

Baseline

For each parent – child dyad five baseline sessions were coded for each activity over 1 (Dyad 2) to 2 weeks (Dyad 1). These were all the videoed sessions for Child 2 and all the play sessions for Child 1. For Child 1, as six mealtime sessions were available, the five sessions coded were randomly selected.

Intervention

Parents videoed themselves interacting with their child during mealtime and play activities each week. For pragmatic reasons, during intervention, the first mealtime and play session of each week were selected for coding, including weeks in which coaching had not occurred. Following parent training, single-level aided language displays were introduced to allow parents to begin aided language stimulation. Using single-level displays made the task easier initially, allowing parents to practice speaking, signing and pointing to symbols while interacting with their children. Videos were reviewed by the first author before the initial coaching session to guide parent coaching.

PODD books were introduced to each dyad during the first or second coaching session. Parent coaching in aided language stimulation was provided by working collaboratively with parents at home, with parents learning to use the PODD books while interacting with their child during mealtime and play activities.

Inter-Rater Agreement

The first and third authors independently coded a random selection of the recorded sessions within each phase (22.5% of all coded sessions). Inter-rater reliability was calculated for each dependent variable in each session by using the formula: number of agreements divided by the number of agreements plus disagreements, multiplied by 100. For Dyad 1's dependent variables, the mean inter-rater agreement across the phases of the study was 88.7% (range 81.5% for parent AAC symbol use to 97.1% for parent speech) and for Dyad 2's dependent variables, the overall mean was 86.61% (range 73% for child symbol use to 94% for parent speech).

Treatment Integrity

A parent training plan and fidelity checklists were prepared beforehand and checked by the first author immediately after each parent training or coaching session. Treatment integrity was calculated by taking the number of steps followed divided by the total number of steps, multiplied by 100. At least 90% of planned components were delivered for each session, with some changes made to suit participants' needs.

Table 2. Parent responses to the communication intervention questionnaire.

		Response	
	Evaluation prompt	Parent 1	Parent 2
1	The training sessions about the communication intervention were useful.	6	6
2	The home coaching sessions helped me learn to communicate with my child.	6	6
3	This communication intervention was appropriate for my child.	6	6
4	I feel confident using this communication intervention (communication boards and books).	6	6
5	This communication intervention was manageable.	5	6
6	In the future, my child's teacher will be able to communicate with my child using communication boards and books.	5	5[a]
7	Communication boards and books help me communicate with my child.	5	6
8	Family members can communicate with my child using communication boards and books.	4	5[b]
9	I like learning to implement this communication intervention myself.	5	6
10	This intervention will allow my child to express herself/himself.	6	6
11	My family will be able to use this method of communication.	6	5[b]
12	It is worth taking the time to learn aided language displays and PODD communication books.	6	6
13	It is realistic to use communication boards and books with my child.	5	6
14	I would recommend this communication intervention to other people.	6	6
15	This communication intervention is beneficial for my child.	6	6

Parents were asked to circle the number that best described their agreement or disagreement with each statement, where 1 = strongly disagree, 2 = moderately disagree, 3 = slightly disagree, 4 = slightly agree, 5 = moderately agree, and 6 = strongly agree.
[a]Parent 2 wrote 'If trained'. [b] Parent 2 wrote 'If interested and willing to learn'..

Social Validity

A communication intervention questionnaire was developed as a subjective evaluation measure of social validity (Schlosser, 1999), using a 6-point Likert scale. Parents completed this at the end of intervention. See Table 2 for further details.

Results

Results for parent AAC symbol use and child symbol use in baseline and intervention are shown for Dyad 1 in Figure 1 (mealtime) and Figure 2 (play). Corresponding data are shown for Dyad 2 in Figures 3 and 4. For Dyad 2, there was a 4-week gap between the first parent training session and the second one, due to unforeseen family circumstances and another gap of 3 weeks between sessions 9 and 10, due to the family moving home.

Parent Outcomes

During mealtime, Parent 1 had variable AAC symbol use at baseline with a range of 11 to 37 ($M = 23.6$) and there was no evidence of a clear trend. There was an increase in level of AAC symbol use during intervention, notably after the introduction of the PODD 12, varying between 26 and 55 ($M = 39.7$) and there was a moderate degree of overlap (40%) with baseline. While variable, there was no clear evidence of overall trend in the intervention data. On balance, there was evidence of an intervention effect. In the play condition, the baseline for Parent 1 was reasonably stable with a downward trend and between 2 and 15 symbol uses ($M = 8.6$). Intervention resulted in an immediate increase in symbol use ($M = 31.6$) and only 8% of data overlapped with baseline. Intervention data were variable but stabilised towards the end of intervention. There was unambiguous

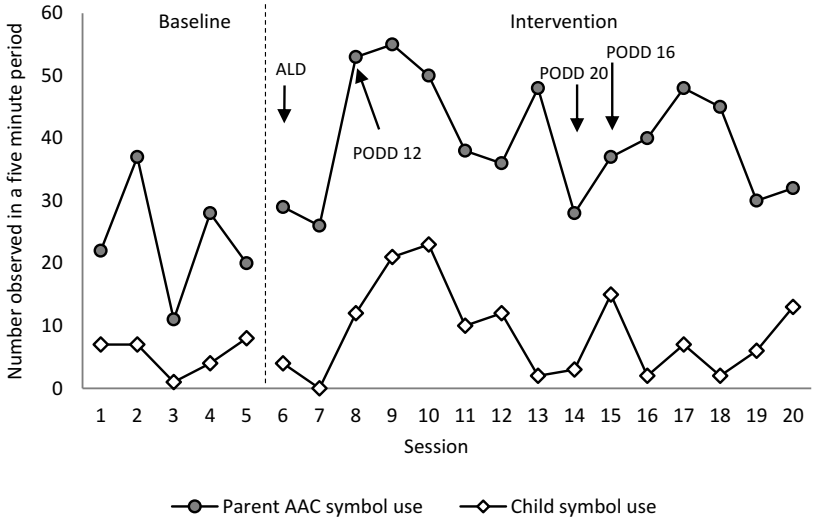

Figure 1. Dyad 1, mealtime: Number of parent AAC symbol use and child symbol use in each 5 min session. ALD = aided language display. PODD = pragmatic organisation dynamic display communication book.

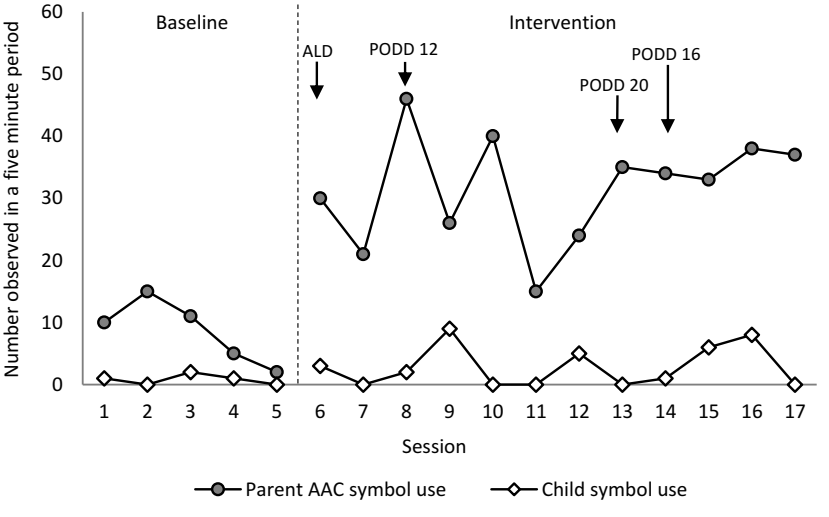

Figure 2. Dyad 1, play: Number of parent AAC symbol use and child symbol use in each 5 min session. ALD = aided language display. PODD = pragmatic organisation dynamic display communication book.

evidence of an intervention effect in play. In mealtime, Parent 1's speech count decreased from a baseline mean of 274 spoken words in the 5 min coded period (range 253–297) to an intervention mean of 264 words (202–336). In play, his speech count decreased from a baseline mean of 280 words (224–376) to an intervention mean of 236 words (140–309).

For Parent 2 in the mealtime condition, baseline varied between 4 and 28 AAC symbol uses ($M = 19.4$) and there was a downward trend. With the introduction of intervention, there was a clear initial increase in AAC symbol use, but this was

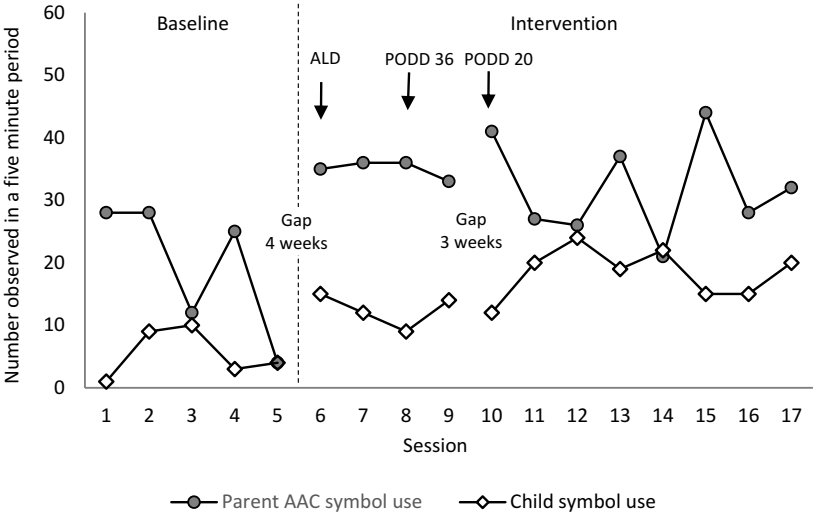

Figure 3. Dyad 2, mealtime: Number of parent AAC symbol use and child symbol use in each 5 min session. ALD = aided language display. PODD = pragmatic organisation dynamic display communication book.

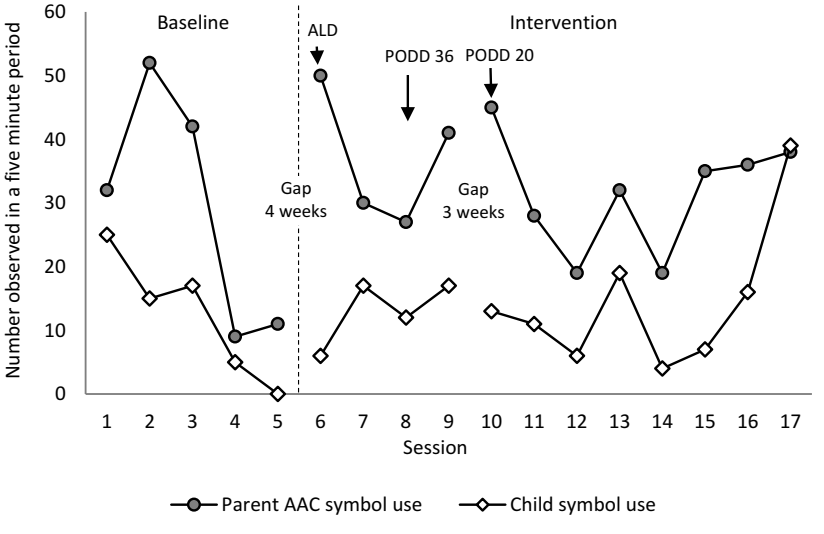

Figure 4. Dyad 2, play: Number of parent AAC symbol use and child symbol use in each 5 min session. ALD = aided language display. PODD = pragmatic organisation dynamic display communication book.

followed by a decrease and more variable performance in the second half of intervention. Across the full intervention period, mean parent symbol use was 33.0 with some variability (range 21–41) and moderate overlap with baseline (33%). While not unequivocal given the drop in symbol use in the latter part of intervention, there was evidence of an intervention effect. Interpretation of baseline play data was complicated as in the first three sessions, the mother engaged in ritualised counting songs where signs and gestures were used for numbers. While this resulted in a large

number of AAC symbols being used, they were less varied and atypical of the subsequent data, where this activity was not conducted. Thus, while the mean number of symbols uses was 42 for the first three counting song sessions (range 32–52), in the remaining (non-counting song) sessions only 9 and 11 symbols were used. This differential resulted in a marked downward trend in baseline. In intervention, where counting songs were not used, a mean of 33.3 symbol uses was present (range 19–50), which was well above the non-song baseline sessions but below those where the number song activity was present. Thus, given the variability in baseline, clear inferences about the effect of intervention cannot be drawn for this activity but intervention levels were well above comparable baseline sessions where a ritualised song was not used. Parent 2 increased her speech rate during intervention. In mealtime, her speech count increased from a baseline mean of 197 spoken words in a 5 min period (range 132–251) to an intervention mean of 261 words (159–348). In play, her speech count increased from a baseline mean of 241 words (198–268) to an intervention mean of 299 words (245–374).

Child Outcomes

In the mealtime condition, Child 1 had a low and stable baseline with little symbol use ranging from 1–8 ($M = 5.4$) per session. There was no initial change during intervention but after the introduction of the PODD 12 book there was a marked increase in Child 1's symbol use, with up to 23 symbol uses in a session. However, child symbol use reduced, with some variability, in the second half of the intervention. Across the whole intervention phase, there was a small increase in symbol use ($M = 8.8$) but with high variability (range 0–23) and considerable overlap with baseline data (54% overlap). Thus, while there was some evidence of improvement with intervention, a strong assertion of experimental effect is prevented by the degree of variability in intervention and the degree of overlap with baseline. In the play condition, Child 1 used very few symbols in baseline with a range of 0–2 ($M = 0.8$). There was a small increase in intervention ($M = 2.8$) but a high degree of data overlap (58%), so an intervention effect is difficult to confidently assert.

In the mealtime condition, Child 2 had a low and stable baseline ($M = 5.4$, range 1–10) for symbol use. Intervention was associated with an increase in mean number of symbols used to 16.4 (range 9–24), an increasing trend and limited overlap with baseline data (8%). Overall, a clear intervention effect can be asserted. For the play condition, baseline data was also affected in the first three sessions by use of the aforementioned ritualised counting songs. Child symbol use in these three sessions averaged 19 (range 15–25). This compares to the remaining two sessions where 5 and 0 symbols were used. As with the parent data for this activity, the disparity between the song and non-song sessions resulted in a sharp downward trend in baseline. During intervention, where the counting song was not used, the mean number of symbols used per session was 13.9 (range 4–39). This was well above the comparable baseline sessions where the counting song was not present but below those sessions where singing was present. Again, consistent with the parent data, given the variability in baseline, clear inferences about the effect of intervention cannot be drawn for this activity but intervention levels were well above comparable baseline sessions where ritualised songs were not used.

Social Validity

Feedback from all parents in parent training evaluations indicated they found the information relevant and felt confident to implement the approach. Parent responses to the communication intervention questionnaire were very positive. They are provided in Table 2.

Discussion

Through the coaching process, parents learned to use the resources with their children at home. Parents considered the intervention to be manageable and beneficial to their children. Both parents increased their overall AAC symbol use, providing increased AAC input to their children. The PODD books appeared to be a useful tool for aided language stimulation, with data indicating increased child symbol use when PODD books were introduced during the intervention compared to baseline measures, although these results were suggestive, rather than conclusive.

The pilot study documents an example of the process and timeframes for parent training and coaching to introduce this intervention. The study extended over 4 months, at the end of which participants were provided with a customised PODD book and there was evidence parents were using aided language stimulation successfully. The pilot study also provided an opportunity to trial measurement methods. It was feasible to measure changes in both parent and child language outcomes within relatively short timeframes, suggesting future research within more rigorous multiple baseline studies will be possible.

All parents and children demonstrated increases in their communication skills under some conditions. An increase in parents' use of AAC symbols was found in mealtime (both parents) and play (one parent). The exception was the play activity for Parent 2 (Figure 4). This context did not provide clear results, due to variations in the play activities used. The lack of a stable baseline was a limitation and meant no inferences could be drawn about results for that activity. In conducting research, there is a degree of tension between internal and external validity (Tuckman, 2012). In the present study, the decision was undertaken to allow parents free choice of activities to make the context as naturalistic as possible and enhance external validity. A consequence of this decision was that Parent 2 used ritualised counting songs in the early baseline sessions in the play context that yielded atypical performance and compromised internal validity. More generally, variability in parent AAC symbol use, which occurred to some extent in all activities, may have been due to a combination of factors: (a) changes in the focus of each week; (b) changes in the PODD books being trialled; (c) health issues, and (d) family events, such as moving home.

Rate of parent speech varied across the two parent – child dyads. Parent 1 slowed his rate of speech for his son, while increasing his use of AAC. This suited Child 1's learning requirements, as Child 1 had a severe delay in his receptive language and a hearing impairment.

During intervention, both children initiated expressive symbolic messages on their aided language resources, in addition to using some key word signs and speech approximations. Being able to point to pictures at the beginning of the study may have assisted their uptake of using these aided language tools, unlike in the Snodgrass and Meadan

study (Snodgrass & Meadan, 2018), where the child did not yet have the ability to clearly touch items on his electronic device to select messages. Overall, the results offer some indication that parent implementation of the intervention using PODD books increased children's symbol use in the mealtime context. The results for play suggested an increase in child symbol use for both children, but due to the level of overlapping data for Child 1 and difficulties with baseline measurements for Child 2, an intervention effect could not be clearly asserted for either child.

The degree of structure within interactions may impact outcomes (Kent-Walsh, Murza, Malani, & Binger, 2015; Shire & Jones, 2015). Play was a less structured and predictable context than mealtime, requiring more navigation from one page to another than in the mealtime activity, which may have contributed to the variability of results. Differences in the predictability of tasks and in the learning requirements for using aided AAC in the different contexts may help to explain differences in the variability of parent and child outcomes across contexts in this pilot study. Given the lower predictability of the play context, it may be appropriate to provide more specific guidance for parents in selecting play activities in future studies. Future research could compare the demands of communicating in different contexts to communicate both predictable and unpredictable messages and across a range of communication functions (Porter & Cafiero, 2009; Shire & Jones, 2015).

This pilot study had a number of limitations. An AB design is a weak experimental design, but it suited the purpose of this pilot study to explore the feasibility of the intervention and to learn about likely timeframes, to pave the way for more rigorous experimental research in the future. Another limitation within this design was that the baseline and intervention time intervals differed because of pragmatic limitations during the intervention phase. Time constraints for this research study also meant that formal data collection on intervention finished just as customised PODD books were introduced. Another limitation was that data on operational skills that parents were coached in were not formally included in the data collection. Differences in the results for parent and child language outcomes in mealtime compared to play activities may have partly related to differences in operational skills. There were less complex demands in the more predictable and routine mealtime context. Operational skills, such as navigation across multiple sections of the PODD book, were more frequently required during play compared to mealtimes. Play vocabulary was more varied as this changed from one session to the next and was unstructured compared to the natural repetition involved in the mealtime context. Treatment integrity measures for parent training, and coaching relied on self-report by the researcher. Finally, there was the lack of formal measurement of maintenance and generalisation.

Future studies would be improved by (a) using a multiple baseline research design; (b) broadening measurement of dependent variables to include operational skills and more details of parent and child language (e.g. pragmatic, semantic and syntactic language functions); (c) including objective measurement of treatment integrity; (d) including maintenance and generalisation measures; and (e) longitudinal research examining the impact of using PODD books on the quality of parent – child interactions and children's speech and language development. Results suggest that more time may be needed with continued intervention and measurement of outcomes once customised PODD books are introduced.

Conclusion

Coaching parents to implement aided language stimulation using PODD communication books with young children at home appeared to be feasible, providing preliminary evidence of positive parent and child language outcomes. Parents reported that they found it beneficial. Within the limitations of this study, parents appeared to increase their use of AAC when speaking to their children and the children appeared to increase their symbol use, with stronger results for one child compared to the other. The preliminary encouraging findings support the need for future research into this intervention, using more robust research designs and with further development of the procedures and measurements trialled in this pilot study.

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Disclosure statement

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